

Is climate changing?

Face of global warming leaves scientists baffled
Global warming patterns ocean food chain
Climate chaos predicted
Rising sea levels
Rising temperatures
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Front-page news
Weather is the most-to-moment state of atmospheric conditions, such as temperature, precipitation, wind, clouds, and air pressure. Climate is the expected or general pattern of weather for a place or region over extended periods of time. Climate never used to make the news, but unusual weather conditions in recent years seem to have everyone talking about it now.

Heating up fast: the 1980s and 1990s
Over the past 140 years, Earth's atmosphere has warmed. The temperature increase has not been steady, but since the 1980s warming has accelerated. Scientists are concerned that we are entering a period of unprecedented global warming caused by humans.

Global temperature change
A much different future
This map shows predicted differences in global surface air temperatures between 1910 and 2040. The greatest differences are predicted to be at high latitudes and in the interior of continents. Canada may experience more temperature change over the next several decades than most regions of the world.

Did you know?
The twentieth century was the warmest century of the last 1000 years, and the 1990s was the warmest decade of that century.

Nature's thermometers
Glaciers expand when climate cools and they shrink when it warms. The margin of Wedgemont Glacier, near Whistler, has retreated hundreds of metres over the last two decades, due mainly to melting during warm summers. Most glaciers around the world are shrinking, proof that climate is warming.

Did you know?
Experts have different opinions about the future of climate. How do you determine who's right?

Did you know?
8000 years ago, average temperatures in southern British Columbia were 1° to 2° C warmer than today.

Did you know?
Scientists now know that Earth's climate has been much more stable and for longer during the last 10,000 years than at any other time in the last 100,000 years. This remarkable stability has allowed human society to flourish. Even so, there have been changes in climate over this period, with far-reaching effects.

Did you know?
Wings settled Greenland during a warm period, when climate was much like today. The so-called Medieval Warm Period between 1000 AD and 1300 AD. Climate cooled in the thirteenth and fourteenth centuries, forcing Vikings to abandon their Greenland settlements.

Did you know?
Europe experienced unusually cold weather during the Little Ice Age, which began in the thirteenth century and ended in the late 1800s.

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TEMPERATURE RISING

Climate change in southwestern British Columbia



? water supplies ? food production ? human health ? biodiversity ? ecosystem health ? sea-level rise ? weather extremes ? environmental refugees ?

We are altering the composition of the atmosphere, causing climate to change. Scientists predict that by the middle of the twenty-first century, average temperatures in southwestern British Columbia will be several degrees warmer than today, and that winters will be wetter and summers drier. Such changes would be the largest and most rapid of the last 10 000 years and would have profound effects on our lives and the ecosystems that support us. We are all in this together. Climate change is a global issue, not just a regional or local one — the atmosphere has no borders!



Climate has always changed

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Why is climate changing now?

Greenhouse gases: the big three
CO₂, CH₄, and N₂O

The carbon balance
Carbon is present in the atmosphere and oceans. Huge amounts of carbon are also stored within the Earth in fossil fuels and sedimentary rocks, and on the Earth's surface in vegetation and soils. Carbon occurs in the atmosphere mostly before the Industrial Revolution. Before the Industrial Revolution, additions of CO₂ and other greenhouse gases to the atmosphere were balanced by removals, thus atmospheric CO₂ concentrations in the atmosphere have increased 30% since the start of the Industrial Revolution in the 1700s. Scientists predict that atmospheric CO₂ will double from pre-industrial levels in the next 40 to 60 years. The cause of the rapid buildup of CO₂ is human activities: burning fossil fuels (coal, oil, and natural gas), agricultural practices, and deforestation. There is widespread concern that the recent dramatic buildup of CO₂ and other greenhouse gases is changing our climate. The continuing buildup of these gases is expected to profoundly warm the planet.

How can we reduce the amount of carbon in the atmosphere?
The main energy-absorbing or greenhouse gases, aside from water vapour (H₂O), are carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). CH₄ and N₂O absorb far more long-wave radiation than CO₂, and are much more potent greenhouse gases. However, CO₂ has the greatest influence because it is much more abundant than the other two gases.

Did you know?
Motor vehicle exhaust is the source of nearly 30% of greenhouse gas emissions in the Lower Fraser Valley.

Did you know?
Venus, our planetary neighbour, has an atmosphere rich with CO₂. Due to the greenhouse effect, temperatures reach 430°C. Similar conditions would exist on Earth if all the carbon stored in rock and vegetation were to be released as CO₂.

The air we breathe

Smog trapped in Fraser Valley
Vancouver, Port Moody, Kelowna, and some other cities in southern British Columbia lie within valleys whose mountain walls trap polluted air. Airborne pollutants are usually dispersed by winds, but on calm days they can become concentrated beneath a layer of warmer air. The pollutants worsen asthma, trigger lung function, and can cause death. Bad air days and related health costs will increase if summers become warmer, drier, and longer. The problems will worsen as more people, driving more cars, move to the Lower Mainland and the Okanagan River valley.

Did you know?
Have you noticed a change in air quality where you live? What has caused the change?

Coastal floods and failing slopes

Origin of a debris flow
Wetter winters mean less stable slopes and more landslides. Of greatest concern are 'debris flows' — watery slurries of mud, gravel, and boulders that travel at high speeds down steep mountain slopes during heavy rains. Damaging debris flows will become more common if our climate gets wetter.

Did you know?
In 1948, the Fraser River overflowed protective dikes in Fraser Valley and flooded the towns of Mission, Matsqui, and Chilliwack. Salmon-harvesting people were forced out of their homes by the floodwaters, and total losses amounted to about \$200 million in 1999 dollars.

Did you know?
A debris flow swept through the village of Lions Bay in February 1983, killing two people.

Did you know?
What has been done to protect residents of Lions Bay and travellers along the Sea-to-Sky Highway from debris flows?

Rising seas

Types of shorelines
Most glaciers will shrink as climate warms, and the water from the melting glaciers will raise sea level. Ocean waters will expand as they warm, causing the sea to rise further. The expected rise in sea level over the next 100 years is 15 cm to 95 cm. The effect will be greater in areas such as the Fraser River delta, where the land is slowly sinking due to forces operating deep within the Earth. Sea level could rise much more if parts of the large ice sheets in Antarctica and Greenland were to melt.

Vulnerable shorelines
As sea level rises, shores formed of loose, easily eroded sediments may shift inland. Even today, parts of the coastline of the Strait of Georgia are eroded by waves during winter storms. Higher seas may also flood deltas, tidal marshes, and other low-lying coastal areas. Dikes may have to be built or upgraded to protect these areas.

Did you know?
Motor vehicle exhaust is the source of nearly 30% of greenhouse gas emissions in the Lower Fraser Valley.

Salmon in hot water

Goodbye salmon, hello tuna?
Pacific salmon live in cool ocean waters. Southern British Columbia is near the southern limit of their range. Warming of the North Pacific could force salmon northward, reducing their numbers in rivers in southern British Columbia. Warm-water fish, such as tuna and mackerel, may take their place.

Did you know?
Mackerel, a warm-water fish species, has been found in recent years in the waters of Vancouver Island. There is concern that mackerel may replace salmon, further disrupting stocks.

Did you know?
What impact would lower salmon returning to spawn in the Fraser River and its tributaries have on the economy of British Columbia?

Low-water blues

Changing river flow
Stream flow in the southern Interior has changed over the last 30 years. Spring runoff starts earlier and autumn rains come later, extending the period of low summer flow. More precipitation falls as rain than as snow in autumn, therefore snowpacks are smaller. Smaller snowpacks result in lower stream flow in summer. These trends will continue if climate continues to warm.

Upper Similkameen River
Longer, warmer summers and lower, summer stream flows will affect hydroelectric power generation. In the future, some reservoirs may not fill to their present levels, and the amount of electricity generated from them will be less than today.

Did you know?
Hydroelectricity generates 80% of British Columbia's renewable power needs.

Did you know?
On average, each person uses over 200 L of water at home every day. This is equal to about one full bathtub. The amount of water through business and services that support us. If we had to reduce the amount of water, it would take some 75 taps with a 1 L flow rate.

Forests in transition

Today
The future?

Changes in Southern Interior forests
As climate warms, some plant species in British Columbia's Interior will extend their ranges northward and to higher elevations. Drought-tolerant trees, such as Douglas fir and Pseudotsuga, will be favoured over trees requiring more moisture, such as spruce. Dry grasslands may replace Douglas fir forests in some areas, and trees will invade alpine meadows. Plants adapted to the new climate will appear first in areas disturbed by fire, logging, and extreme drought. Changes in forest composition, tree growth, fire frequency, and insect infestation will affect how and where trees are harvested and replanted.

Effects of climate change on forests and forestry
Drought stresses trees, leading to dieback and forest fires. Changes in forest composition, tree growth, fire frequency, and insect infestation will affect how and where trees are harvested and replanted.

Did you know?
The cost of logging fires in British Columbia during the hot dry summer of 1998 was \$20 million.

Did you know?
How will the British Columbia forest industry adapt to climate change?

Down on the farm

Mixed blessings in the Interior
Climate change is expected to bring warmer year-round temperatures, wetter springs, and drier summers to interior valleys such as the Okanagan and Similkameen. Vineyards and orchards, currently limited to the south Okanagan, could spread as far north as Kamloops. Severe winter cold may be reduced, but the drier, warmer, summer climate will increase drought during the growing season.

Impacts of climate change on agriculture
Warmer temperatures increase crop yields and to higher elevations. Reduced water heating and increased evapotranspiration reduce soil moisture. Introduction of new pests and diseases may reduce crop yields.

Did you know?
Warmer spring temperatures have already prompted the Okanagan and Similkameen vineyards and orchards, currently limited to the south Okanagan, to spread as far north as Kamloops. Severe winter cold may be reduced, but the drier, warmer, summer climate will increase drought during the growing season.

Did you know?
Warmer year-round temperatures and drier summers and autumns should benefit agriculture in the Fraser Valley and on southern Vancouver Island. A longer and warmer growing season will lead to higher yields and more diverse crops. On the other hand, warmer winters may increase insect pests, and wetter springs may delay planting, reducing the benefits of warmer weather during the growing season.

How do we measure up?

Global CO₂ emissions per capita
Why do you think Canada ranks second in per capita CO₂ emissions? One reason is our oil exports. This cannot be changed, but we can't.

Did you know?
Canada has about 0.5% of the world's population but produces 2% of global CO₂ emissions.

Greenhouse gas emissions
Individual emissions: 25%
Other Canadian emissions: 75%

Did you know?
Improving energy efficiency is the easiest, cheapest, and a fast way to reduce greenhouse gas emissions.

Did you know?
How can you help reduce these emissions — as a consumer, as a voter, through community involvement?

Let's meet the challenge

Which path will we choose?
Business as usual
Our Future
Our Choice
Increase
Decrease
Now
Future

Who aren't we acting?
People tend to respond best to immediate risks, but what if...
• a bad situation occurs in a decade away,
• the most serious impacts are a decade away,
• issues are complex, it's hard to pinpoint cause and effect,
• the costs of the problem are invisible,
• we assume someone else is working on a solution, and
• many people don't believe there is a problem.

Who, me?
Natural Resource Canada, Geological Survey of Canada, Environment Canada, Pacific and Yukon Region, Simon Fraser University, Earth Sciences

Temperature Rising - Climate Change in Southwestern British Columbia
Addendum to Volume 1, Canada Country Study, Environment Canada
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Canadian Institutes for Climate Studies
British Columbia Forestry Centre
Environment Canada, Environmental Adaptation Research Group
Fisheries and Oceans Canada, Pacific Biological Station
Natural Resources Canada, Canadian Forest Service
Pacific Forestry Centre, Agricultural Development
Royal British Columbia Museum
Sea to Sky Centre of Environmental Education

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Want to know more?
E. Taylor and B. Turner (Eds.), 1997. Responding to global climate change in southwestern British Columbia. Volume 1 of the Canada country study climate impacts and adaptation. Environment Canada and British Columbia Ministry of Environment, Lands and Parks, 350p.
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Canada
BRITISH COLUMBIA
Greater Vancouver Regional District

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