



CCCR2019

REPORT

Definitions



Government
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Glossary - Canada's Changing Climate Report (CCCR)



These definitions have been compiled to assist users/readers of *Canada's Changing Climate Report (CCCR)*. In keeping with the broad audience for this report, definitions of technical terms have been kept short and plain language has been used to the extent possible. The definitions draw primarily on the glossary to the Working Group I contribution to the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (IPCC, 2013), and also use the glossary to the IPCC Special Report on Global Warming of 1.5 °C (IPCC, 2018). Definitions have been simplified in some cases. Readers interested in a more technical definition of a term should refer to the glossaries of the IPCC assessment reports.

Active layer

Layer of the ground that is subject to annual thawing and freezing in areas underlain by permafrost.

Adaptation

Process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.

Aerosols

Tiny airborne solid or liquid particles, with a typical size between 0.01 and 10 µm, that stay in the atmosphere for at least several hours. Aerosols may be of either natural or anthropogenic origin. Aerosols may influence climate in several ways: directly through scattering and absorbing radiation, and indirectly by acting as cloud condensation nuclei or ice nuclei, modifying the optical properties and lifetime of clouds.

Albedo

The fraction of solar radiation reflected by a surface or object. Albedo is a unitless quantity that ranges from 0 to 1, with 0 representing a black surface that absorbs 100% of energy and 1 representing a white surface that reflects 100% of energy. Snow-covered surfaces have a high albedo, the surface albedo of soils ranges from high to low, and vegetation-covered surfaces and open oceans have a low albedo. The Earth's planetary albedo varies mainly through varying cloudiness, snow, ice, leaf area, and land cover changes.

Anomaly

Departure from the average over a reference period.

Anthropogenic

Resulting from or produced by human activities.

Arctic amplification

The phenomenon by which observed and modelled temperature in the Arctic changes by more than the global mean temperature in response to changes in radiative forcing.



Attribution

Identifying the causes of an observed change or event in terms of the relative contributions of multiple causal factors.

Biogeochemical cycles and processes

Cycles or processes in which chemical substances (such as carbon) move through the biotic (living) and abiotic (non-living, such as water and rock) components of the Earth system.

Black carbon

A carbonaceous aerosol that is emitted as a result of the incomplete combustion of carbon-based fuels. Black carbon is operationally defined based on measurement of light absorption and chemical reactivity and/or thermal stability. It is sometimes referred to as soot.

Carbon emissions budget

The cumulative amount of carbon that can be emitted while keeping the global surface temperature increase to a given level, taking into account contributions of other greenhouse gases and climate forcing agents.

Carbon cycle

The carbon cycle is the flow of carbon (in various forms, such as carbon dioxide) through the atmosphere, ocean, terrestrial and marine biosphere, and lithosphere.

Carbon-cycle feedback

A climate feedback involving changes in the properties of the land and ocean carbon cycle in response to climate change that can affect the flux of CO₂ between the atmosphere and ocean and between the atmosphere and the land biosphere. Also referred to as climate-carbon cycle feedback.

Climate

The average, or expected, weather and related atmospheric, land, and marine conditions for a particular location. In statistical terms, it is the mean and variability of relevant measures over a period of time ranging from months to thousands or millions of years. The classical period for averaging these variables is 30 years, as defined by the World Meteorological Organization.

Climate change

A persistent, long-term change in the state of the climate, measured by changes in the mean state and/or its variability. Climate change may be due to natural internal processes, natural external forcings such as volcanic eruptions and modulations of the solar cycle, or to persistent anthropogenic changes in the composition of the atmosphere or in land use.

Climate drivers

Factors that disrupt Earth's energy balance, forcing climate toward warmer or cooler conditions. Climate drivers can be either natural or anthropogenic, and the main drivers are solar irradiance variations, volcanic



eruptions, changes in atmospheric composition (including increases in greenhouse gases), and changes to the land surface. "Climate forcing agents" and "external forcings" have the same meaning.

Climate feedbacks

An interaction in which a perturbation in one climate condition causes a change in a second, and the change in the second ultimately leads to an additional change in the first. A positive feedback amplifies the original change, and a negative feedback dampens it. See also "positive feedback" and "negative feedback."

Climate forcing agents

Factors that disrupt Earth's energy balance, forcing climate toward warmer or cooler conditions. Climate forcing agents can be either natural or anthropogenic, and the main agents are solar irradiance variations, volcanic eruptions, changes in atmospheric composition (including increases in greenhouse gases), and changes to the land surface. "Climate driver" has the same meaning.

Climate variability – see internal climate variability

Confidence

In the calibrated language used in this report, *confidence* (italicized in text) in the validity of a result is based on the type, amount, quality, and consistency of evidence (e.g., mechanistic understanding, theory, data, models, expert judgment) and the degree of agreement across multiple lines of evidence. Confidence is expressed qualitatively. Five qualifiers are used to express assessed levels of confidence in findings: very low, low, medium, high, and very high.

Coupled Model Intercomparison Project (CMIP5)

The World Climate Research Programme has established this project to coordinate, analyze, and archive a range of simulations and projections from multiple climate models. Thirty-six different models participated in the fifth phase of the project (CMIP5). See also Chapter 3, Box 3.1.

Cryosphere

Places on (and beneath the surface of) the Earth where water is frozen, including snow, sea ice, ice shelves, land ice (glaciers and ice caps), freshwater ice (lake and river ice), permafrost, and seasonally frozen ground.

Data inhomogeneity

Changes in climate data time series that are caused by non-climatic factors. Such factors include changes in measuring devices used, and changes in the location of measuring devices. Data inhomogeneity can affect the reliability of long-term trend assessment if not accounted for. Techniques to remove inhomogeneity have been developed (called "climate data homogenization").

Degree day

Degree days are a useful measure of how cold or warm a location is, to help in planning for energy use and climate change adaptation. Degree days are defined as annual accumulation of daily temperature above or below a certain threshold. They are calculated by subtracting the threshold temperature from daily mean



temperature (in the case of cooling degree days or growing degree days), or by subtracting daily mean temperature from the threshold (in the case of heating degree days). If the degree day for a particular day is negative, it is counted as zero.

Heating degree days: the annual sum of the number of degrees Celsius each day's mean temperature is below 18°C. For example, if the daily mean temperature on a particular day is 12°C, the heating degree day contribution for that day is 6°C. If the daily mean temperature is above 18°C, the heating degree day value for that day is zero.

Cooling degree days: the annual sum of the number of degrees Celsius a given day's mean temperature is above 18°C.

Growing degree days: the annual sum of the number of degrees Celsius each day's mean temperature is above 5°C in a growing season.

Freezing degree days: the annual sum of the number of degrees Celsius each day's mean temperature is below freezing (0°C).

Detection

Demonstrating that an observed change in climate is inconsistent with internal climate variability. Changes in the climate become detectable if they are large when compared with internal climate variability.

Downscaling

Methods to transform global Earth system model results into more detailed, local to regional scale information that is better suited to adaptation planning and impact studies.

Earth system model

A coupled atmosphere–ocean general circulation model in which a representation of the carbon cycle is included, allowing for interactive calculation of atmospheric CO₂ or compatible emissions. Additional components (e.g., atmospheric chemistry), may be included. Coupled atmosphere–ocean general circulation models provide a comprehensive representation of the climate system, among the most comprehensive of the suite of climate models currently available.

Emission Scenario – see scenario

Equilibrium line

Transition boundary on a glacier that divides the zone of ablation (where there is net annual loss of ice) from the zone of accumulation (net annual gain of ice).

Evaporation

The process by which water changes from a liquid to a gas and the primary pathway by which water moves from the liquid state back into the water cycle as atmospheric water vapour.

Evapotranspiration



The sum of evaporation from the land surface plus transpiration from plants.

Potential evapotranspiration: The amount of evapotranspiration that would occur if sufficient water were available (i.e., if water were unlimited). It is estimated using many different techniques, some using only temperature, and others using temperature, humidity, sunlight, and wind.

Actual evapotranspiration: The amount of evapotranspiration that actually occurs (dependent on the amount of available water).

[External forcing – see climate forcing agents](#)

[Extremely likely](#)

Likelihood of 95%–100%; see Likelihood.

[Forcing scenario – see scenario](#)

[Glacier mass balance](#)

The difference between annual mass gained through snowfall and other forms of accumulation, and mass lost due to sublimation, melt, calving loss, and basal/marine melt (for marine-terminating glaciers).

[Glacier surface mass balance](#)

The difference between annual mass gained at the surface through snowfall and other forms of accumulation (re-freezing rain and avalanches), and mass lost due to sublimation and melt.

[Global mean surface temperature](#)

Estimated as the average (or mean) temperature for the world from measurements of sea surface temperatures and near-surface air temperatures above the land.

[Greenhouse effect](#)

The infrared radiative effect of all those constituents of the atmosphere that absorb infrared radiation. Some of the sun's energy is absorbed by the atmosphere, land, and ocean and re-emitted as longwave infrared radiation (radiant heat). Some of this radiant heat is absorbed and then re-emitted by greenhouse gases and clouds (and to a small extent aerosols) in the lower atmosphere, trapping heat in the lower atmosphere and reducing how much is radiated to outer space. These substances emit infrared radiation in all directions, but, everything else being equal, the net amount emitted to space is normally less than would have been emitted in the absence of these absorbers because of the decline of temperature with altitude in the troposphere and consequent weakening of emission.

[Greenhouse gas](#)

Greenhouse gases are gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation emitted by the Earth's surface, by the atmosphere itself, and by clouds. This property causes the greenhouse effect. Water vapour (H₂O), carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), and ozone (O₃) are the primary greenhouse gases in the Earth's atmosphere. There are also a number of entirely human-made greenhouse gases



in the atmosphere, such as the halocarbons and other chlorine- and bromine-containing substances.

Heavy precipitation (rainfall and snowfall)

Heavy rainfall is defined as rainfall greater than the annual 90th percentile from all rainfall events greater than 1 mm/day. Similarly, heavy snowfall is defined as snowfall greater than the annual 90th percentile from all events greater than 1 mm/day.

High confidence

Five terms are used to express assessed levels of confidence in findings based on the availability, quality and level of agreement of the evidence: very low, low, medium, high, very high. See Confidence.

Hypoxia

Low or depleted oxygen in a water body.

Ice jam

Blockage in a river formed by the accumulation of broken ice, usually during spring breakup but may occur during winter thaws.

Ice phenology

Start and end dates of ice cover, determined by freeze onset and ice breakup dates.

Ice Shelves

An ice shelf is a wide, floating slab of ice of considerable thickness extending from the coast, usually with a very gently sloping surface, often filling embayments in the coastline of an ice sheet. Nearly all ice shelves are in Antarctica, where most of the ice discharged into the ocean flows via ice shelves.

Industrial Era

The period in history, beginning around the mid-18th century and continuing today, marked by a rapid increase in industrial activity powered by the combustion of fossil fuels, and associated increases in emissions of carbon dioxide.

Integrated assessment model

Integrated assessment models (IAMs) integrate knowledge from two or more domains into a single framework. For example, one class of IAM combines economic, demographic, and policy modelling with simplified physical climate models to make projections of population growth, economic development, land use, and the implications of different policy options for climate-relevant emissions and climate impacts.

Internal climate variability

Variations in climate driven by processes internal to the climate system, including modes of climate variability – natural variations in climate with identifiable characteristics affecting particular regions over certain time periods. These modes include the well-known El Niño–Southern Oscillation as well as other such modes that



recur in various parts of the world over varying time periods.

Likelihood

The chance of a specific outcome occurring, where this might be estimated probabilistically. In this report the likelihood of a result occurring is based on quantified measures of uncertainty expressed probabilistically (based on statistical analysis of observations or model results, or expert judgment). Likelihood is expressed quantitatively.

Likely

Likelihood of 66%–100%; see Likelihood.

Lithalsa

Permafrost mounds formed by ice segregation (i.e., formation of discrete ice layers resulting from migration and subsequent freezing of pore water) within mineral soils.

Little Ice Age

Climate interval during the last millennium characterized by a number of extensive expansions of mountain glaciers and moderate retreats in between them, both in the Northern and Southern Hemispheres. The timing of glacial advances was different between regions. Therefore, the term Little Ice age is commonly applied to the time period between 1400 and 1900.

Low confidence

Five terms are used to express assessed levels of confidence in findings based on the availability, quality and level of agreement of the evidence: very low, low, medium, high, very high. See Confidence.

Lower atmosphere (troposphere)

The lower layer of Earth's atmosphere, from the Earth's surface to about 10 km in altitude at mid-latitudes (ranging from 9 km at high latitudes to 16 km in the tropics on average). This is the part of the atmosphere where clouds and weather phenomena occur.

Medium confidence

Five terms are used to express assessed levels of confidence in findings based on the availability, quality and level of agreement of the evidence: very low, low, medium, high, very high. See Confidence.

Meridional overturning circulation

Sometimes referred to as the "global conveyor belt," this system of surface and deep ocean currents is a large-scale three-dimensional circulation pattern that transports large amounts of water, heat, salt, carbon, nutrients, and other substances between the upper and deep ocean and around the globe.

Mitigation

A human intervention to reduce the sources or enhance the sinks of greenhouse gases. A source is any



process, activity or mechanism – natural or human – that releases greenhouse gases to the atmosphere. Conversely, a sink is any process, activity or mechanism – natural or human – that removes greenhouse gases from the atmosphere. In addition to referring to greenhouse gases, mitigation also applies to reducing emissions of other substances that have a heating effect on the climate.

Mode of internal variability

A robust feature of the climate system with identifiable characteristics, affecting particular regions over certain time periods. Generally, these features alternate or “oscillate” between one set of patterns and an alternate set. A familiar example is the El Niño–Southern Oscillation (ENSO), but there are other modes of variability also discussed in this report.

Model (Climate model)

Complex computer simulation of the climate system usually including interacting simulations of the atmosphere, ocean, ice and land surface. The climate system can be represented by models of varying complexity. Climate models are developed and used at climate research institutions around the world to make projections of future climate, based on future scenarios of greenhouse gas and aerosol forcing. See also Earth system model.

Negative feedback

An initial perturbation can trigger feedbacks in the climate system that alter the response to an initial forcing. If the feedback dampens the response to the initial forcing, it is a negative feedback.

Nival catchments

Drainage area where river regimes are dominated by snowmelt in the spring.

North (as in Canada's North)

In this report, Canada's North is defined by the political boundaries of the three territories (Yukon, Northwest Territories, and Nunavut).

Northern Canada

In this report, the region north of 60° north latitude. This term refers to northern Canada according to a geographic boundary.

Ocean Acidification

Increased acidity (reduction in pH) of seawater over an extended time period, as a result of increased carbon dioxide concentration in the ocean, primarily due to uptake of carbon dioxide from the atmosphere.

Open water fraction

Proportion of the sea with open water (rather than sea ice)

Palmer Drought Severity Index



Drought index developed by Palmer (1965) that uses temperature and precipitation. It is based on a procedure of water-balance accounting by which excesses or deficiencies in moisture are determined in relation to average climatic conditions. Calculation of the index takes into account precipitation, potential evapotranspiration, and infiltration of water into a given soil zone.

Palsa

A peaty mound with a permafrost core of alternating layers of segregated ice and peat or mineral soil.

Pan evaporation

A direct method of measuring evaporation in which a standardized pan filled with water is placed in an environment and subsequent evaporation is monitored.

Paris Agreement

The Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC) was adopted on 12th December 2015 in Paris, France, at the 21st session of the Conference of the Parties (COP) to the UNFCCC. The agreement, adopted by 196 Parties to the UNFCCC, entered into force on 4th November 2016. One of the goals of the Paris Agreement is to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels. Canada ratified the Paris Agreement in 2016. The Paris Agreement is intended to become fully effective in 2020.

Permafrost

Soil and rock with a temperature that remains at or below 0°C for at least two consecutive years.

Positive feedback

An initial perturbation can trigger feedbacks in the climate system that alter the response to an initial forcing. If the feedback amplifies the effect of the initial forcing, it is a positive feedback.

Radiative forcing

The net change in the energy balance of the Earth system due to an external perturbation, measured in units of watts per square metre (W/m²).

Relative sea level

The sea level relative to land; this is distinguished from “absolute” sea level, which is referenced to the centre of the Earth.

Representative Concentration Pathway

Scenario of future greenhouse gas concentrations, and other anthropogenic forcings, for the period beginning in 2006 based on various possible levels of human emissions. Representative Concentration Pathways (RCPs) are identified by a number indicating the change in radiative forcing by the end of the 21st century. RCP2.6 represents a low emission pathway with a radiative forcing of roughly 2.6 W/m², RCP4.5 and RCP6

represent intermediate emission pathways, and RCP8.5 represents a pathway with continued growth in greenhouse gas emissions, leading to a radiative forcing of roughly 8.5 W/m^2 at the end of the century. The word representative signifies that each RCP provides only one of many possible scenarios that would lead to the specific radiative forcing characteristics. The term pathway emphasizes that not only the long-term concentration levels are of interest, but also the trajectory taken over time to reach that outcome.

Scenario (forcing scenario, emission scenario)

A plausible representation of the future based on a coherent and internally consistent set of assumptions. A forcing scenario is a possible future evolution of greenhouse gas concentrations and other anthropogenic forcings. An emission scenario describes a possible future evolution of emissions of greenhouse gases, and other climate drivers. They assist in climate change analysis, including climate modelling and the assessment of impacts, adaptation, and mitigation. The likelihood of any single emissions path described in a scenario is highly uncertain.

Sea ice

First-year sea ice: Sea ice that forms in the fall or winter and does not survive the summer melt. Also referred to as “seasonal ice.”

Landfast sea ice: Sea ice that is anchored to the shore or ocean bottom and does not move with wind or currents.

Multi-year sea ice: Sea ice that has survived at least one melting season.

Sea ice area: Area covered by sea ice, not including open water fraction (proportion of the sea with open water). Sea ice area is always less than sea ice extent.

Sea ice concentration: Percentage of an area that is covered with sea ice.

Sea ice extent: Area of ocean, including open water fraction (proportion of the sea with open water), with ice cover above a specified amount of ice (usually 15%).

Segregated ice

Ice in discrete layers or ice lenses, formed by ice segregation (due to migration and subsequent freezing of pore water).

Sink

Any process activity or mechanism that removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas or aerosol from the atmosphere. For example, methane is removed from the atmosphere primarily through photochemical reactions that destroy it chemically. Carbon dioxide is removed from the atmosphere through uptake by plants during photosynthesis (a “land sink”) and through dissolving in ocean water (an “ocean sink”).

Snow cover duration

The number of days in the year with snow cover, from onset in the fall through to melt in the spring.



Snow cover fraction

Proportion of time the ground is covered by snow (for example 15 days out of 30 days with snow cover in a month = 50% snow cover fraction).

Snow water equivalent

The depth of water that would result if the entire snowpack were melted instantaneously.

Solar irradiance

The strength of radiation from the sun received at the Earth's surface in watts per square metre. Solar irradiance varies over a cycle of approximately 11 years, resulting in variations in total solar irradiance of the order of 0.1%.

Source

A source is any process, activity or mechanism — natural or human — that releases greenhouse gases, an aerosol, or a precursor of a greenhouse gas or aerosol to the atmosphere.

Standardized Precipitation Evapotranspiration Index

Drought index developed by Vicente-Serrano et al. (2010) that is an extension of the Standardized Precipitation Index (SPI).

The SPI is a drought index developed by McKee et al. (1993), based solely on precipitation. It consists of fitting and transforming a long-term precipitation record into a normal distribution that has zero mean and unit standard deviation. SPI can be computed over several time scales, ranging from one to 48 months, and thus considers effects of accumulating precipitation deficits, which are critical for soil moisture and hydrological droughts.

By contrast, the Standardized Precipitation Evapotranspiration Index (SPEI) takes into account both precipitation and potential evapotranspiration (PET) in determining drought (precipitation minus PET). As with SPI, SPEI consists of fitting and transforming a long-term precipitation-minus-PET record into a normal distribution that has zero mean and unit standard deviation. It can also be computed on a range of timescales from one to 48 months.

Stratification

Ocean density stratification refers to the presence of layers in the ocean with different densities. Light, relatively warm and fresh near-surface water generally overlies cold, denser, subsurface water.

Surface mass balance

In glaciers and ice caps, the difference between annual mass gained through snow accumulation and mass lost due to melt runoff.

Thaw slumping



A slope failure mechanism characterized by the melting of ground ice and downslope sliding and flowing of the resulting debris.

Thermokarst

Irregular topography formed by the thawing of ice-rich permafrost.

Transpiration

The process by which moisture is carried through plants from roots to small pores on the underside of leaves, where it changes to vapour and is released to the atmosphere. Transpiration is essentially evaporation of water from plant leaves.

Uncertainty

In this report, “uncertainty” is used mainly in the statistical sense, to mean quantified measures of likelihood. The report often presents uncertainty ranges at a given likelihood level, such as 90%, meaning that the true value is assessed to have a 90% chance of falling within the given uncertainty range. Uncertainty may be based on statistical analysis of observations or model results, or on expert judgment. “Uncertainty” is also used occasionally in this report to express the unreliability of projections of future events.

Very high confidence

Five terms are used to express assessed levels of confidence in findings based on the availability, quality and level of agreement of the evidence: very low, low, medium, high, very high. See Confidence.

Very low confidence

Five terms are used to express assessed levels of confidence in findings based on the availability, quality and level of agreement of the evidence: very low, low, medium, high, very high. See Confidence.

Very likely

Likelihood is 90%–100%; see Likelihood.

Very unlikely

Likelihood is 0%–10%; see Likelihood.

Virtually certain

Likelihood is 99%–100%; see Likelihood.



References

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