



# Churchill

## Low Carbon Emissions (RCP4.5)

Climate Variable	Season	1981–2010 (Baseline)	2021–2050			2051–2080		
			L	M	H	L	M	H
Mean Temperature	Annual	-6.1 °C	-4.8 °C	-4.1 °C	-3.3 °C	-3.2 °C	-2.8 °C	-2.3 °C
	Summer	11.0 °C	11.6 °C	12.2 °C	12.8 °C	12.7 °C	13.0 °C	13.6 °C
	Winter	-24.1 °C	-21.7 °C	-20.8 °C	-19.7 °C	-19.6 °C	-18.5 °C	-17.6 °C
Precipitation	Annual	470.5 mm	476.9 mm	510.8 mm	545.6 mm	498.7 mm	533.6 mm	578.3 mm
	Summer	158.6 mm	146.0 mm	159.4 mm	172.5 mm	148.4 mm	161.7 mm	174.0 mm
	Winter	68.0 mm	69.6 mm	77.1 mm	84.9 mm	73.8 mm	82.5 mm	96.2 mm
Days ≥ 30 °C	Annual	0.6 days	0.0 days	1.7 days	4.0 days	1.0 days	2.5 days	5.0 days
Nights ≥ 20 °C	Annual	0.0 days	0.0 days	0.0 days	0.0 days	0.0 days	0.0 days	0.0 days
Days ≤ -30 °C	Annual	44.2 days	14.0 days	22.6 days	31.0 days	3.0 days	10.0 days	17.0 days
Frost-Free Period	Annual	96.8 days	98.0 days	111.4 days	123.0 days	106.0 days	118.4 days	133.0 days
5 °C Degree Days	Annual	656.7	728.2	793.7	850.6	849.0	903.0	952.5
10 °C Degree Days	Annual	239.5	271.2	317.2	358.4	342.9	382.2	422.3
Freeze-Thaw Cycles	Annual	41.7 cycles	33.0 cycles	43.6 cycles	58.0 cycles	32.0 cycles	41.9 cycles	52.0 cycles
Max 1-day Precip Total	Annual	70.0 mm	41.3 mm	104.5 mm	192.3 mm	42.3 mm	104.1 mm	170.9 mm
Max 3-day Precip Total	Annual	154.9 mm	88.0 mm	233.4 mm	437.6 mm	101.1 mm	236.8 mm	396.2 mm

## High Carbon Emissions (RCP8.5)

Climate Variable	Season	1981–2010 (Baseline)	2021–2050			2051–2080		
			L	M	H	L	M	H
Mean Temperature	Annual	-6.1 °C	-4.7 °C	-3.8 °C	-2.8 °C	-2.3 °C	-1.0 °C	0.6 °C
	Summer	11.0 °C	11.9 °C	12.4 °C	13.0 °C	13.6 °C	14.4 °C	15.6 °C
	Winter	-24.1 °C	-21.5 °C	-20.0 °C	-18.4 °C	-17.6 °C	-15.7 °C	-13.5 °C
Precipitation	Annual	466.7 mm	475.5 mm	522.0 mm	577.9 mm	498.6 mm	564.1 mm	641.0 mm
	Summer	158.4 mm	149.6 mm	162.5 mm	175.2 mm	146.3 mm	163.6 mm	189.1 mm
	Winter	67.2 mm	66.5 mm	77.4 mm	89.8 mm	78.7 mm	92.3 mm	111.9 mm
Days ≥ 30 °C	Annual	0.6 days	0.0 days	2.2 days	4.0 days	2.0 days	4.5 days	7.0 days
Nights ≥ 20 °C	Annual	0.0 days	0.0 days	0.1 days	0.0 days	0.0 days	0.1 days	0.0 days
Days ≤ -30 °C	Annual	44.6 days	13.0 days	20.1 days	31.0 days	0.0 days	4.0 days	8.0 days
Frost-Free Period	Annual	97.3 days	98.0 days	113.8 days	124.0 days	115.0 days	131.4 days	144.0 days
5 °C Degree Days	Annual	659.3	756.1	826.8	897.9	957.6	1083.9	1246.8
10 °C Degree Days	Annual	240.0	290.3	336.2	380.6	414.7	504.7	624.9
Freeze-Thaw Cycles	Annual	41.3 cycles	33.0 cycles	42.1 cycles	52.0 cycles	32.0 cycles	41.5 cycles	47.0 cycles
Max 1-day Precip Total	Annual	66.6 mm	38.9 mm	126.0 mm	196.0 mm	42.6 mm	129.8 mm	229.6 mm
Max 3-day Precip Total	Annual	145.6 mm	99.2 mm	274.3 mm	476.6 mm	100.0 mm	289.5 mm	588.9 mm

## Where did this data come from?

Global Climate Models (GCMs) are used to depict how the climate is likely to change in the future. Since no one climate model can be considered 'correct', it is important to use many GCMs to capture a range of possible conditions. The GCM data we used were obtained from the Pacific Climate Impacts Consortium (PCIC). PCIC collected temperature and precipitation data produced by 12 different models and used advanced statistical techniques to create high-resolution (daily, 10km) versions of the data for all of Canada (for more information visit [pacificclimate.org](http://pacificclimate.org)).

## What is the difference between the 'Low' and 'High' Carbon emission scenarios?

One of the most important inputs into GCM simulations of the future climate is the expected concentration of greenhouse gases (GHGs; especially carbon dioxide) in the atmosphere as a result of human activity. In the scientific literature these future GHG concentrations are used to calculate Representative Concentration Pathways (RCPs). The High Carbon scenario (RCP8.5) assumes that we continue to emit very large amounts of carbon dioxide from the burning of fossil fuels; the Low Carbon scenario (RCP4.5) assumes that drastic reductions of emissions in the coming decades will stabilize the concentration of GHGs in the atmosphere by the end of this century. We did not use RCP2.6, an even lower emissions scenario.

## How were the Low, Mean, and High values calculated?

For a variety of climate variables, we used the projected values from the 12 models to calculate an *ensemble* (average) value for each year. The ensemble values for the 2021-2050 and 2051-2080 periods were used to calculate the 'M', or mean, values. To portray the range of values within the 30-year periods, we calculated the 10th and 90th percentiles; 10% of the annual values are lower than the 'L' values and 10% of the annual values are higher than the 'H' values. For comparative purposes, we also calculated ensembles for the baseline period of 1981-2010 (as simulated by the models).

## Some definitions

**Frost-Free Period:** number of consecutive days without freezing temperatures

**5 °C Degree Days:** cumulative number of degrees greater than 5 °C (using daily mean temperatures)

**Freeze-Thaw Cycles:** number of days with maximum temperature > 0 °C and minimum temperature < -1 °C



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