

# Climate Impacts Summary

The City of Vancouver is warming. Global climate models<sup>1</sup> project annual average temperature to increase by 1.7°C to 4.0°C, and indicate an average increase of 2.9°C between the 1971-2000 baseline and the 2050s. This fact sheet provides specific information intended to facilitate adaptation as the climate changes. All values in the summary are for the 2050s relative to the 1971-2000 baseline. Additional variables, seasons, projections for the 2080s, and maps were also produced and provided to the City of Vancouver<sup>2</sup>.

## Temperature

As our climate warms, the city can expect a more than doubling in the number of summer days above 25°C, from an average of 18 days per year to 43 days per year in the 2050s. Warmest summer days (TXX) are projected to become 3.9°C warmer and coldest winter nights (TNN) 4.9°C warmer. Similarly, very hot days (1-in-20 year events; RP20Tx), are projected to intensify, rising from 32°C to 37°C.

## Precipitation

A modest 5% increase in winter precipitation is projected by the 2050s, with slightly larger increases of 7% in spring and 12% in fall. Summer is the only season with a projected precipitation decrease, of 19%, exacerbating existing differences between the wet and dry seasons. The length of dry spells (CDryD) is also projected to increase, by about 23% (from 23 to 29 consecutive dry days on average, per year). However, extreme rainfall events are expected to become increasingly common and intense by more than indicated by the seasonal amounts, with 33% more precipitation on very wet days (R95p) and 63% more on extremely wet days (R99p). Rarer events (1-in-20 year events; RP20p) are projected to increase in intensity by 36%, indicating a potential for increased flooding.

## Heating and Cooling

Warmer cold season minimum temperatures result in lower heating demand with 29% fewer heating degree days (HDD). In contrast, warmer summer temperatures are expected to drive greater cooling requirements as cooling degree days grow from 60 to 250 degree days per year. While still modest this is about 25% more than Portland, Oregon's historical average and a considerable increase from current (nearly non-existent) summer cooling demand. Hot summer days (days above 30°C) that occur only once per year on average are projected to occur 12 times per year by the 2050s.

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<sup>1</sup> All values provided are from an ensemble of 12 Global Climate Models as described at <http://www.pacificclimate.org/data/statistically-downscaled-climate-scenarios> (CMIP5 models following RCP8.5 downscaled with BCCAQ). Projected changes are for the 2041-2070 difference from 1971-2000, and based on the average of all 12 members of the ensemble. Where ranges are given they represent the 10<sup>th</sup> and 90<sup>th</sup> percentiles of the range of change of the full ensemble. Projections are averaged over the City of Vancouver boundary except snowpack which is based on the boundaries of the region's water supply watersheds.

<sup>2</sup> Please contact the City of Vancouver Sustainability Group for more information

## Ecosystem Impacts

The projected warming has implications for impacts to ecosystems, including a 15% increase in the length of the growing season (GSL), a 72% decrease in the number of days with frost (FD), and a 44% increase in growing degree days (GDD). Warmer temperatures and reduced precipitation intensity during the summer result in longer stretches of days without precipitation (23% more consecutive dry days; CDryD). The coldest day in winter on average is projected to warm from -9.4°C to -4.7°C while very cold days (1-in-20 year; RP20Tn), are projected to warm, from -16°C in the past to -11°C in the 2050s.

## Snowpack

Precipitation as snow and snowpack is projected to decrease significantly over time. Snowpack is an important indicator of how much snowmelt will be available to flow into the region's reservoirs. There are large differences in projected snowpack changes depending on elevation. At elevations near sea level where there were low levels of snowpack in the past, declines of up to 100% are projected to occur. At higher elevations, the projected changes are smaller, with declines of less than 20% projected on the upper portions of the mountains. For our region's water supply watersheds as a whole, the April 1 snowpack is projected to decrease by 58%.

Table 1. Selected climate indices for past and future for City of Vancouver.

Index	Label	Past (1971-2000)	Anomalies (2050s)	Percent Change (2050s)
Warmest Summer Days	TXX	29°C	3.9 (2.2 to 4.8) °C	n/a
Coldest Winter Days	TNN	-9.4°C	4.7 (3.3 to 6.1) °C	n/a
Ice Days	ID	4 days	-2 (-1 to -3) days	-66 (-44 to -86) %
Summer Days	SU	18 days	43 (25 to 60) days	139 (38 to 233) %
Cooling Degree Days	CDD	58 DD	242 (106 to 374) DD	415% (230% to 640%)
Growing Degree Days	GDD	2120 DD	930 (550 to 1300) DD	44% (26% to 63%)
Heating Degree Days	HDD	2860 DD	-820 (-540 to -1170) DD	-29% (-37% to -19%)
Wet Day Precipitation	R95p	306 mm	98 (17 to 182) mm	33% (5% to 62%)
Extreme Precipitation	RP20p	89 mm	31 (8 to 51) mm	36 % (11% to 56%)
Dry Spells	CDryD	23 days	5 (0 to 11) days	21% (1% to 42%)

Note: generally the projected climate changes described in this summary are quite uniform throughout the city. Certain impacts, however, may differ between lower and higher areas as well as between locations adjacent to the ocean and those at a further distance from the shoreline.

Table 2. Definitions of climate indices for City of Vancouver.

Index	Label	Definition
Summer Days	SU	Annual count of days where max temperature is >25°C
Warmest Summer Days	TXX	Max temperature of the warmest day in summer
Coldest Winter Days	TNN	Min temperature of the coldest day in winter
Ice Days	ID	Annual count of days when maximum temperature is below 0°C
Cooling Degree Days	CDD	Total of the number of degrees above 18°C that occur daily, summed over each day of the year. Indicator for cooling demand.
Growing Degree Days	GDD	Total of the number of degrees above 5°C that occur daily, summed over each day of the year. Indicator for plant growth.
Heating Degree Days	HDD	Total of the number of degrees below 18°C that occur daily, summed over each day of the year. Indicator for heating demand.
Wet Day Precipitation	R95p / R99p	Annual total precipitation that falls on days where precipitation exceeds the 95 <sup>th</sup> / 99 <sup>th</sup> percentile of precipitation (this index reflects the combined effect of changes in the intensity and frequency of heavy precipitation).
Extreme Precipitation (20 Year)	RP20p	Max daily precipitation expected to occur on average once in 20 years (this index reflects only the intensity of that event).
Extreme Min/ Max Temperature (20 Year)	RP20Tn / RP20Tx	Min daily / Max daily temperature expected to occur on average once in 20 years
Dry Spells	CDryD	Maximum length of consecutive days with precipitation < 1mm
Growing Season Length	GSL	Growing season length is the length between the first span of six days above 5°C in spring, and the first span of six days below 5°C in the fall.