Summary of 2050s climate projections for Whistler area

The annual average temperature in the Whistler region is projected to warm by about 3°C by the 2050s compared to the recent past. This projection is based on the average of a set of climate model projections, with projected warming ranging from 1.8°C to 4.0°C. Annual precipitation is projected to increase by 7%, with a range of 0% to 10%.

Adaptation to climate change in the region requires more specific information, however, such as how warming and changes in precipitation may differ throughout the seasons, and how it will translate into indices of climate extremes. To assist with this, the Pacific Climate Impacts Consortium provided maps and tables of projected climate change including indices of extremes for the region to the Resort Municipality of Whistler. For more details see methodology below and http://etccdi.pacificclimate.org/list_27_indices.shtml for definitions of indices.

The purpose of this memo is to summarize some of the key information for adaptation. In particular, projected changes fall into three main categories:

1. increase in the intensity and frequency of heavy rain events
2. longer, hotter, drier summers
3. milder winters with reduced snowpack at lower elevations

For example, despite only a modest increase in annual precipitation, the projected increase in the amount of precipitation that will be received on very and extremely wet days is considerable, 40% (9% to 61%) and 74% (38% to 99%) for the R95p and R99p indices, respectively (these indices reflect the combined effect of changes in the intensity and frequency of heavy precipitation). The increase in the magnitude of annual maximum one-day precipitation (1 year return period) is 13% (6% to 17%), while the 20-year return period event is projected to increase by 32% (11% to 51%). Note that these indices reflect only the intensity of the 1-year or 20-year event.

Despite the projected increase in wet events, the maximum length of dry spells (CDD) is also projected to increase, by about 15% (-2% to +40%), on average. Average summer precipitation is projected to decrease according to most models: by 17% (35% decrease to 2% increase). In addition, the projected warming is associated with an increase in summer days above 25°C (index SU) from 10 days per year on average for the region as a whole in the past to 27 (20 to 36) days per year, an increase of 171% (96% to 242%).

Despite increased winter precipitation, milder winters offset potential gains in (December-January-February) snowpack on average throughout the region. Changes in snowpack depend considerably on elevation. At Whistler Village, for example, total projected decreases are around 50 to 100 cm (about 60% to 70% reductions relative to historical values). At higher elevations, projected decreases in snowpack become smaller in absolute terms as these locations remain cold enough on average that most precipitation falls as snow in future (note that increases in both snowpack and

rainfall are possible in these cases). This effect is exaggerated in terms of relative decrease because absolute changes are smaller and these locations have more historical snowfall. At the highest elevation locations with multi-year snowpack and glacier-conditions (shown in white on maps), large reductions in snowfall and snowpack could occur, but the specific numbers at the fringes of the white areas should not be taken as quantitative projections as assumptions in the snowpack model used to produce the maps break down in these locations.

Projected warming in the cold season also translates into changes in several indices of importance to ecosystems: a 30% (19% to 45%) increase in the length of the growing season (GSL) which was historically 141 days per year, a 25% (19% to 32%) decrease in the number of days with frost (FD) from a historical baseline of 212 days per year, and a 39% (35% to 50%) decrease in icing days (when the daytime high is below freezing; ID) from 80 days per year historically.

While the changes projected for Whistler are consistent with the rest of British Columbia in terms of heavy rain, coastal areas in terms of drier and hotter summers, and milder winters with reduced snowpack mostly at the lower elevations, the combination of these three main effects in one area is remarkable.

Methodology

The results in this memo are based on a subset of climate models selected from the Coupled Model Intercomparison Project 5 following the “business as usual” estimate of greenhouse gas emissions, Representative Concentration Pathway 8.5 (RCP8.5). Adaptation planning typically makes use of this business as usual RCP8.5 projections. The historical baseline period is 1971-2000 and the future projections are for the 2050s (2041-2070). All results reported here are averaged over the Whistler Landscape Unit.

The CMIP5 climate models were first screened according to their historical skill and then an ensemble of 12 models was chosen to provide the widest range of projected change for a set of climate parameters. These projections were downscaled to a 10 km grid by making use of a historical daily time series (ANUSPLIN) in conjunction with the climate model projections (using the BCCAQ statistical downscaling which is a hybrid climate analogue / quantile mapping method). Daily temperature and precipitation observations and future projections at 10 km resolution were then draped over an 800 m grid of 1971-2000 average temperature or precipitation to generate high resolution maps. All values reported in this memo are given as the median value projected by the 12 models, with the range given in brackets of the 10th to 90th percentiles. This range arises from both climate variability and climate model uncertainty.