



Summary of Climate Change Predictions

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Introduction

This document provides a summary of climate change predictions in the Port Phillip and Western Port region. These predictions are defined by two attributes, which are:

1. Representative Concentration Pathways (RCPs); which are estimates of the heat retained in the lower atmosphere and determined by global greenhouse gas emissions, particularly carbon dioxide.
2. Confidence in prediction, based on:
 - The type, amount, quality and consistency of evidence.
 - The extent of agreement amongst the different lines of evidence.

It should be noted that confidence ratings do not equate precisely to the probability of a scenario occurring. Confidence in a prediction about the direction of change may be high but lower for its magnitude due to known modelling deficiencies.

This information has been summarised from [Grose, M. et al., 2015, Southern Slopes Cluster Report, Climate Change in Australia Projections for Australia's NRM Regions: Cluster Reports](#), eds. Ekstrom, M. et al., CSIRO and Bureau of Meteorology, Australia.

PREDICTIONS FOR RCP 2.6 (low CO₂ emissions)

RCP 2.6 represents atmospheric heating estimated to follow emissions that peak around 2020 and then rapidly decline to carbon dioxide concentration at about 420 ppm by 2100. Active removal of carbon dioxide from the atmosphere is likely to be required later in the century for this scenario to be achieved.

RCP2.6 VERY HIGH CONFIDENCE PREDICTIONS

- Increases in annual and seasonal mean, maximum and minimum surface air temperatures.
- Increased mean annual temperature to 2030 between 0.4 and 1.1°C above the 1986–2005 climate.
- Increased mean annual temperature to 2090 between 1.1°C and 2.0°C above the 1986–2005 climate.
- A substantial increase in the temperature reached on the hottest days, the frequency of hot days and the duration of warm spells.
- Continuing sea level rise during the 21st century to between 70mm and 190mm above the 1986–2005 level.
- Increasing acidification of the ocean around Australia.

RCP 2.6 HIGH CONFIDENCE PREDICTIONS

- Natural climate variability will be the major driver of rainfall changes to 2030.
- Twenty-year mean rainfall averages will change by between -10% to +5% annually and about -20 to +15 % seasonally.
- Decreasing frequency of frost-risk days.
- By 2050, the area averaging at least 1 day of snow-cover will decrease by 25 to 55 % and the average snow season will be 20 to 55 days shorter than under the current climate.
- Small changes for mean surface wind speed to 2030.
- Increased evapotranspiration in all seasons by 2090 with largest absolute rates in summer and driven largely by increasing temperatures, but also changes in radiation, humidity and wind speed.
- A harsher fire-weather climate (but there is low confidence in current estimates of the magnitude of the change to fire-weather).
- The rate of increasing ocean acidification will be proportional to carbon dioxide emissions.

RCP 2.6 MEDIUM CONFIDENCE PREDICTIONS.

- The proportion of time spent in any category of drought (from mild to extreme) will increase through the century.

PREDICTIONS FOR RCP 4.5 and 6.0: (intermediate CO₂ emissions)

RCP6.0 represents atmospheric heating estimated to follow the implementation of some mitigation strategies with carbon dioxide reaching 670 ppm by 2100.

RCP4.5 represents atmospheric heating estimated to follow somewhat higher emissions than RCP6.0 in the early part of the century with emissions peaking earlier then declining to a stabilised carbon dioxide concentration at about 540 ppm by 2100.

RCP 4.5 and 6.0 VERY HIGH CONFIDENCE PREDICTIONS

- Substantial increases in annual and seasonal mean, maximum and minimum surface air temperatures.
- Increased mean annual temperature to 2030 between 0.4 and 1.1 °C above the 1986–2005 climate.
- Increased mean annual temperature to 2090 between 1.1°C and 2.0°C above the 1986–2005 climate.
- By 2050, cold years will become warmer than most of the current climate's warm years.

- A substantial increase in the temperature reached on the hottest days, the frequency of hot days and the duration of warm spells.
- Declining snowfall and maximum snow depths.
- Continuing sea level rise during the 21st century to between 70mm and 190mm above the 1986–2005 level.
- Increasing acidification of the ocean around Australia.

RCP 4.5 and 6.0 HIGH CONFIDENCE PREDICTIONS

- Natural climate variability will be the major driver of rainfall changes to 2030 as human-made changes will become apparent.
- General losses of winter-spring rainfall to 2090.
- Increases or decreases in summer rainfall are possible.
- An increase in solar radiation and a decrease in relative humidity in winter and spring.
- Decreases in soil moisture and catchment runoff-driven largely by changes to rainfall and evapotranspiration (the likely magnitudes of these changes remain unclear).
- By 2050, the area averaging at least 1 day of snow-cover will decrease by 25 to 55% and the average snow season will be 20 to 55 days shorter than under the current climate.

RCP 4.5 and 6.0 MEDIUM CONFIDENCE PREDICTIONS

- The proportion of time spent in any category of drought (from mild to extreme) will increase through the century.
- Spring rainfall will decrease by between -25 and -5%.
- Winter rainfall will decrease between -15 and +5%.
- At least 66% probability of sea level rise to 2090 of between 270mm and 660mm.
- Sea level rises several tenths of a metre higher by 2090 if a collapse in the marine based sectors of the Antarctic ice sheet were initiated.

PREDICTIONS FOR RCP 8.5 (high CO₂ emissions)

RCP8.5 describes atmospheric heating estimated for a future with little curbing of emissions and carbon dioxide concentrations reaching 940 ppm by 2100.

RCP 8.5 VERY HIGH CONFIDENCE PREDICTIONS.

- Substantial increases in annual and seasonal mean, maximum and minimum surface air temperatures.

- Increased mean annual temperature to 2030 between 0.4°C and 1.1 °C above the 1986–2005 climate.
- Increased mean annual temperature to 2090 between 2.5°C and 4.0°C above the 1986–2005 climate.
- A substantial increase in the temperature reached on the hottest days, the frequency of hot days and the duration of warm spells.
- By 2050, cold years will be warmer than all the current climate’s warm years.
- Significant losses of snowfall and maximum snow depth.
- Sea surface temperature increases to between 1.6°C and 5.1°C by 2090.
- Continuing sea level rise during the 21st century to between 70mm and 190mm above the 1986–2005 level.
- Increasing acidification of the ocean around Australia.

RCP 8.5 HIGH CONFIDENCE PREDICTIONS

- The annual average number of Melbourne days above 35°C will more than double by 2090.
- By 2050, the area averaging at least 1 day of snow-cover will decrease by 35 to 75% and the average snow season will be 30 to 80 days shorter than under the current climate.
- An increase in solar radiation and a decrease in relative humidity in winter and spring.
- Substantial soil moisture decline, especially during winter and spring with annual decreases in soil moisture and catchment runoff driven largely by changes to rainfall and evapotranspiration (the likely magnitudes of these changes remain unclear).

RCP 8.5 MEDIUM CONFIDENCE PREDICTIONS

- The proportion of time spent in any category of drought (from mild to extreme) will increase through the century, especially by 2090.
- Winter rainfall losses of between -30 and +5% by 2090.
- Spring rainfall losses of between -45 and -5% by 2090.
- At least 66% probability of sea level rise to 2090 of between 390mm and 890mm.
- Sea level rises several tenths of a metre higher than the above estimate by 2090 if the marine based sectors of the Antarctic ice sheet a collapse in the were initiated.