

Communicating Climate Change

Module 3

August 2008

An initiative of the National Agriculture and Climate Change Action Plan

Glimpsing Western Australia's future climate

Climate change projections indicate that Western Australia's climate in the decades ahead will be different to that of the past. Farmers will need to modify their practices to manage the risks presented by the change in climate.

Key facts

- Climate model projections are tools for understanding how the climate will respond to increased greenhouse gas concentrations.
- Unknown future greenhouse gas concentrations and climate model uncertainty result in a range of projected climates.
- Temperature projections for Western Australia indicate continued warming over the coming decades.
- Climate models consistently predict a reduction in winter and spring rainfall for south-west Western Australia.
- Rainfall projections indicate a drying trend for the whole state, apart from the Kimberley region.
- The combination of projected warming and rainfall decline has serious implications for streamflow in Western Australia.
- Potential threats from climate change exist for Western Australian agriculture.
- Farmers need to prepare for unavoidable climate change, as well as help reduce greenhouse gas emissions.

Climate model projections

Climate projections are computer model simulations of the climate. We use them to understand how the world's climate will respond to the rapid increase in atmospheric greenhouse gases associated with human activities. The projections indicate a wide range of possible future climates. There are two main reasons for this:

- We do not know precisely how greenhouse gas concentrations will vary in future. Due to demographic, economic and technological factors, a range of greenhouse gas emission scenarios are possible for the 21st century.
- The climate system is so complex that it is not possible for models to predict the exact state of the Earth's climate several decades into the future.

Scientists use a range of different independent climate models and emission scenarios to estimate future climate. From the spread of these model projections, they can identify the changes that are likely to occur, and those that are less likely to occur.

Climate models are constantly being improved with higher resolution and inclusion of more climate system processes, leading to greater confidence in climate projections.

A cooperative venture between



Australian Government
**Department of Agriculture,
Fisheries and Forestry**
Bureau of Meteorology



Using climate projections

The uncertainty of climate projections makes it difficult for farmers and policymakers to incorporate model output directly into the decisions they make. Nevertheless, climate projections can help to identify potential long-term threats and opportunities associated with climate change.

The climate projections we present here are based on the average projections provided by different climate model simulations using low-, medium- and high-emission scenarios. Further information about these projections can be found at:

<http://www.climatechangeinaustralia.gov.au>

Changes in mean rainfall

By 2030, annual rainfall across most of Western Australia is projected to decrease by 2–5 per cent relative to the climate around 1990 (Figure 1).

By 2070 a decrease of 5–10 per cent is most likely under a low greenhouse gas emission scenario, or a 10–20 per cent decrease under a high-emission scenario.

Winter and spring rainfall is likely to decrease, whereas changes in summer and autumn rainfall are less certain.

A range of independent climate models consistently predict reduced rainfall for south-west Western Australia. When a range of models predict the same result for a given region, it increases confidence in the prediction.

We expect natural climate drivers to strongly influence rainfall variability for many decades to come, counteracting and adding to the projected human-induced changes.

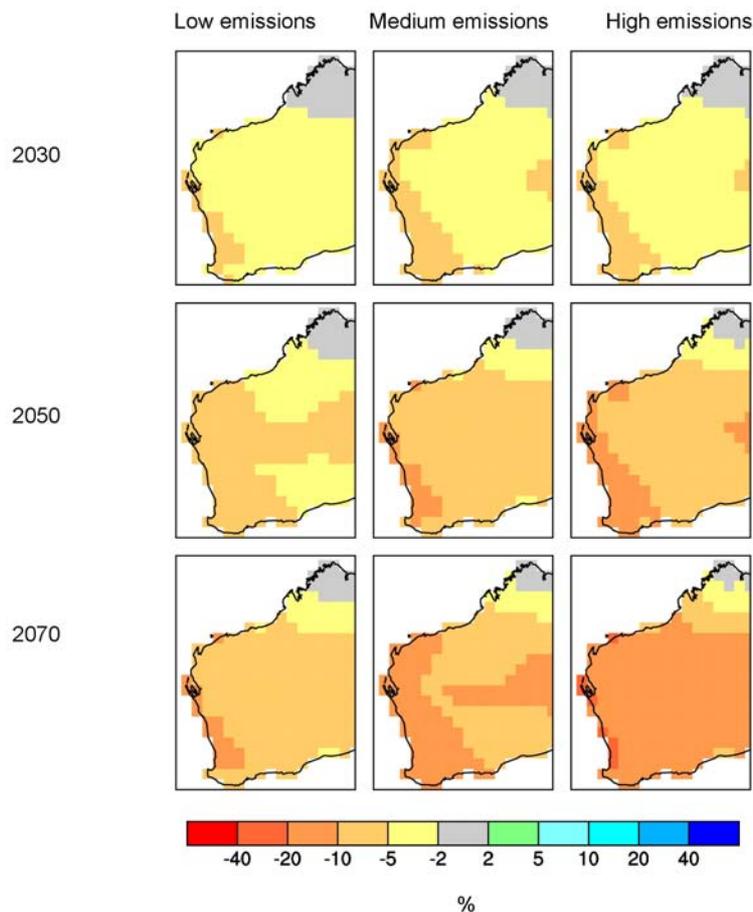


Figure 1: Best estimate (50th percentile of model projections) for Western Australian annual rainfall change (per cent) for 2030, 2050 and 2070 using low, medium and high greenhouse gas emission scenarios.

Changes in drought and extreme rainfall

Most models predict that potential evapotranspiration will increase over Western Australia. Evapotranspiration is the combination of evaporation from soil and water surfaces, and transpiration from vegetation. When these changes are combined with the projected declines in rainfall, an increase in aridity and drought occurrence is likely.

Climate projections show an increase in daily precipitation intensity over much of the state, except the far south-west and central parts. The number of dry days is expected to increase significantly everywhere except for the Kimberley region. This suggests that future rainfall patterns for many areas, including the northern part of the wheatbelt, will have longer dry spells interrupted by heavier precipitation events.

Changes in mean temperature

We are more confident in the projections of mean temperature than those of rainfall.

By 2030, annual average temperatures over Western Australia are projected to increase by up to 1°C in southern and coastal parts of the state, and up to 1.5°C inland (Figure 2).

By 2070 this increase is around 1.5–2.5°C under a low-emission scenario, or around 3–4°C under a high-emission scenario.

Less warming is expected in coastal and southern regions. Projected warming during summer is similar to the annual increase, but slightly greater during spring and slightly less during autumn and winter.

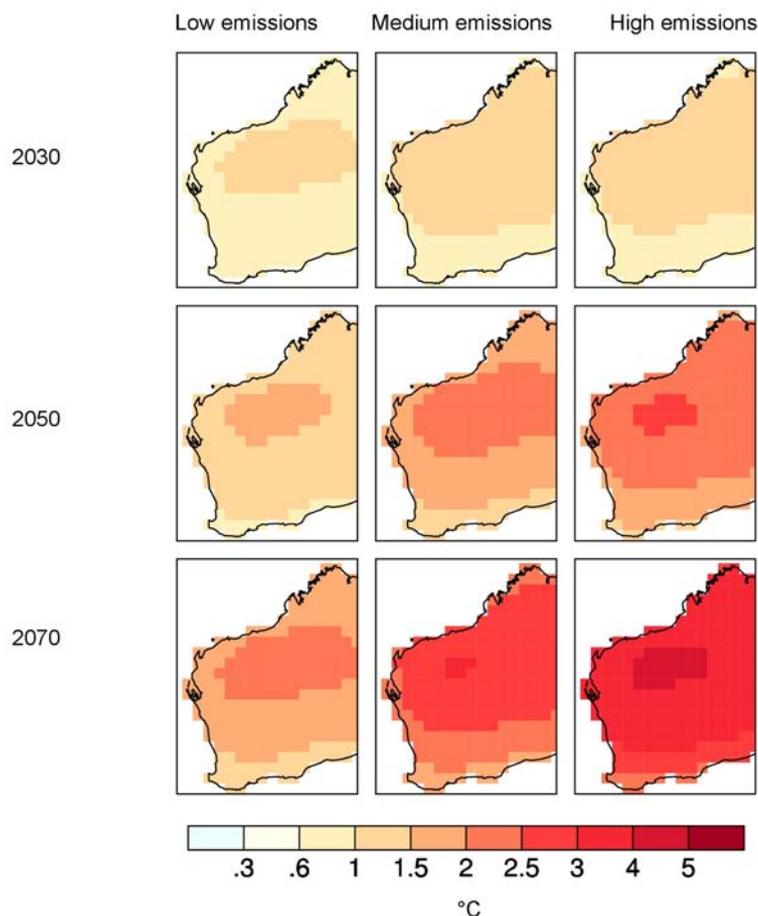


Figure 2: Best estimate (50th percentile of model projections) for Western Australian annual mean temperature change (°C) for 2030, 2050 and 2070 using low, medium and high greenhouse gas emission scenarios.

Potential impacts

The combination of projected warming and less rainfall has serious implications for run-off and water storage. Streamflow into dams in the south-west is projected to decline by up to 40 per cent by 2030 relative to historical average flows.

More general threats for agriculture across southern Australia include:

- decline in productivity due to increased drought and decreased soil moisture
- crop yields benefiting from warmer conditions and higher carbon dioxide levels but vulnerable to reduced rainfall
- greater exposure of stock and crops to heat-related stress and disease
- earlier ripening and reduction in grape quality
- less winter chilling for fruit and nuts
- southern migration of some pests
- potential increase in the distribution and abundance of some exotic weeds

Planning for change

Farmers in Western Australia need to prepare for climate change, as well as help mitigate global warming by reducing greenhouse gas emissions. While further human-induced warming is inevitable, the great range in projected climates by 2070 indicates that we still have a choice about what type of climate we will have by the end of this century.

Further information

The information presented here is sourced from:

- the *Climate Change in Australia* report: <http://www.climatechangeinAustralia.gov.au>
- the Intergovernmental Panel on Climate Change: <http://www.ipcc.ch>
- the Indian Ocean Climate Initiative: <http://www.ioici.org.au>