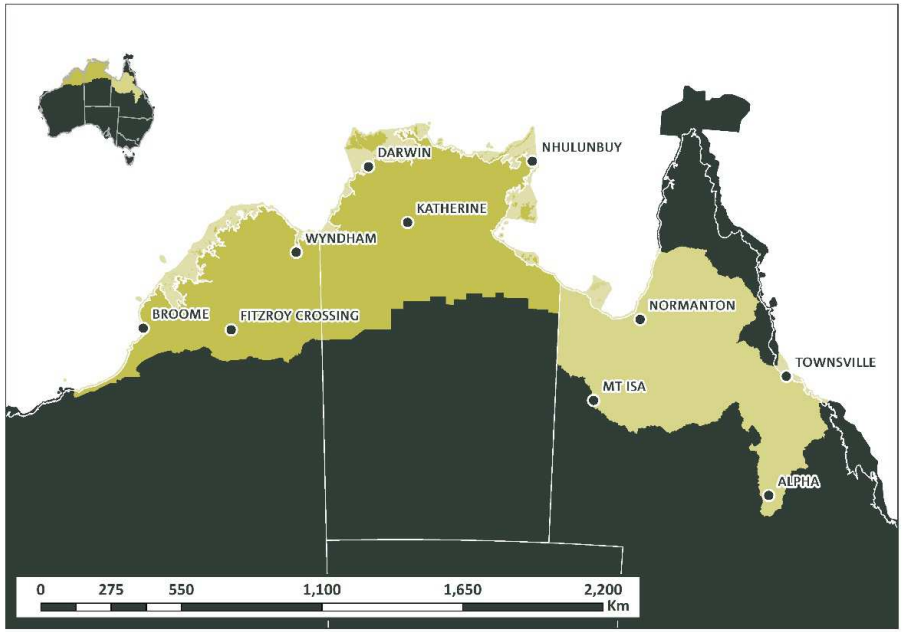
CLIMATE CHANGE IN THE MONSOONAL NORTH



The Monsoonal North cluster includes parts of Western Australia, Northern Territory and Queensland, commonly known as the tropical 'top end'.

This region experiences a pronounced wet and dry season, with differences in the timing between eastern and western parts.

The western part of the Monsoonal North covers tropical rainforests, wetlands and arid rangelands of the Northern Territory, and the steep mountain ranges of the Ord and Fitzroy River catchments of the Kimberley.

In the eastern region relatively intact savannah woodland and important rainforest areas are represented, as well as the Mitchell, Gilbert, Norman, Burdekin and Staaten River catchments, all of which flow into the Gulf of Carpentaria (except Burdekin).

Some of the content for this Pamphlet drawn from Gerbing, C. Webb, L. and Moise, A. 2015 Monsoonal North Cluster brochure, CSIRO and BoM.

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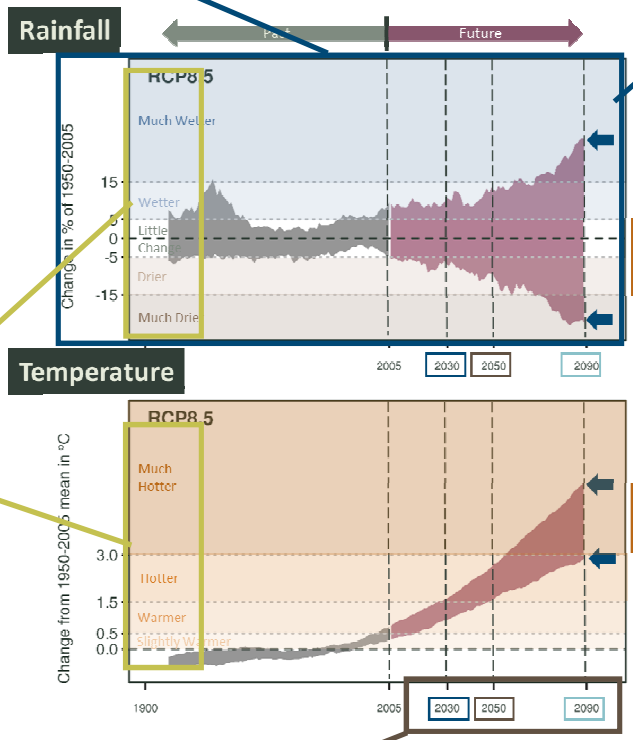
KEY TO THE PROJECTIONS SLIDES

Time series of rainfall (top) and temperature (below) for the historical period (1900 to 2005; grey) and projected period (2005 to 2099; purple) showing the 10th to 90th percentile of the 20-year running mean from 40 CMIP5 models.

Projected period colour code:
Purple: high emissions (RCP8.5)
Blue: intermediate emissions (RCP4.5)
Green: low emissions (RCP2.6)

Categories of warming and rainfall changes are indicated by colour shading on the graph as described in the table:

Rainfall (% change relative to 1950 - 2005)	Temperature (degrees Celsius change from 1950-2005)
Much Wetter (> 15 %)	Much Hotter (> 3.0)
Wetter (5 to 15 %)	Hotter (1.5 to 3.0)
Little change (-5 to +5 %)	Warmer (0.5 to 1.5)
Drier (-5 to -10 %)	Slightly Warmer (0 – 0.5)
Much Drier (> -15%)	



Outlook periods explored are 20 year periods centred on 2030, 2050, 2090.

For adaptation planning, consider top and bottom of the range of plausible change, indicated by the blue arrows.

Descriptions of what could be expected given model representation (40 CMIP5 models) in the various future periods:

2030: Warmer with most models showing little change in rainfall, though a chance of either wetter or drier climate occurs.

2050: Hotter with some models showing little change in rainfall, and other models indicating wetter or drier climates (e.g. ± 15%).

2090: Much hotter with some models showing little change in rainfall, with other models showing much wetter or much drier climates (e.g. ± 25 %), resulting in an increase in the range.

*Seasonal projections may differ from annual. Seasonal detail shown later. Maximum model consensus by 2090, if it exists, is indicated by orange bar. For adaptation planning, consider top and bottom of the range of plausible change. The 2090 range is indicated by the blue arrows.

Maximum consensus (at least 33% of models) indicated by orange box. In this example, the maximum consensus future by 2090 could be described as 'much hotter and little change in rainfall to drier'.

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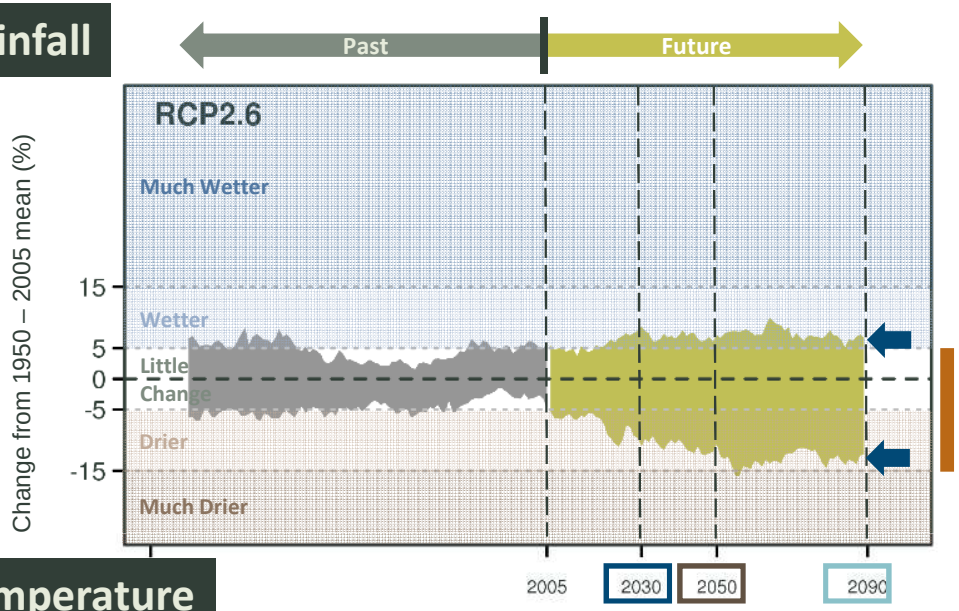
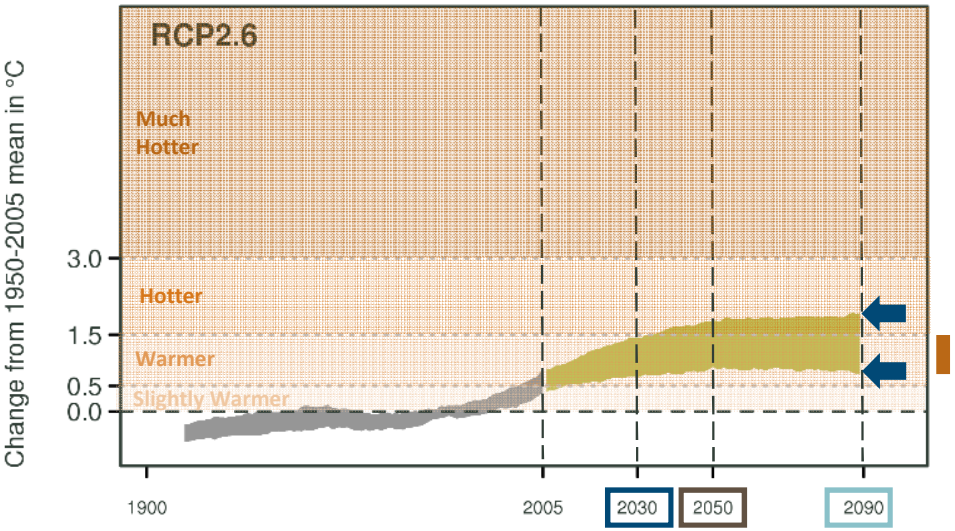
Climate projections for Monsoonal North (annual*) : Low emissions

Rainfall



Temperature



2030: Warmer with most models indicating little change in rainfall.

2050: Warmer to hotter with many models indicating little change in rainfall, but a chance of wetter or drier.

2090: Warmer to hotter with little change in rainfall or a drier climate indicated in most models.

***Seasonal projections may differ from annual. Seasonal detail shown later.**

Maximum model consensus by 2090, if it exists, is indicated by orange bar.

For adaptation planning, consider top and bottom of the range of plausible change. The 2090 range is indicated by the blue arrows.

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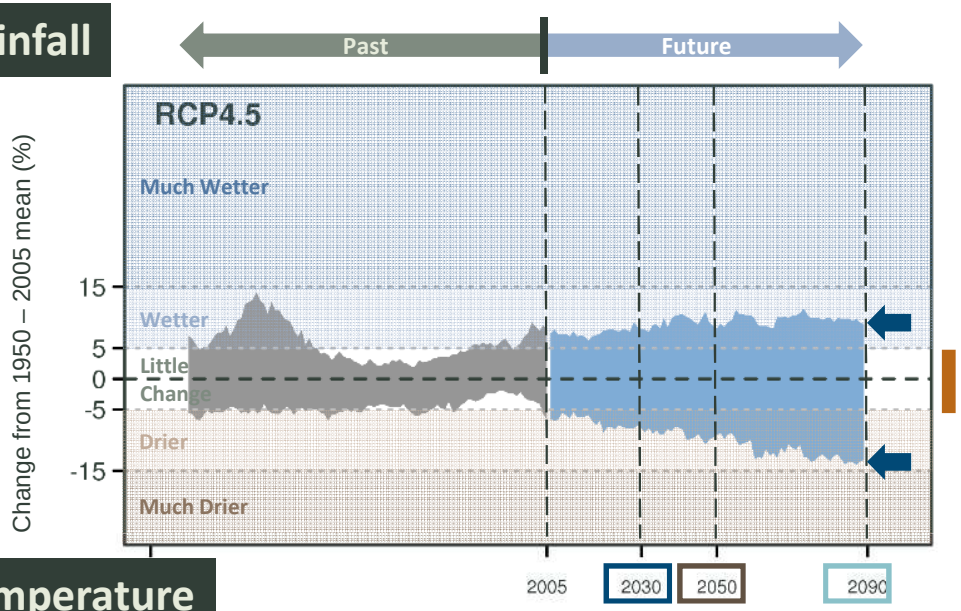
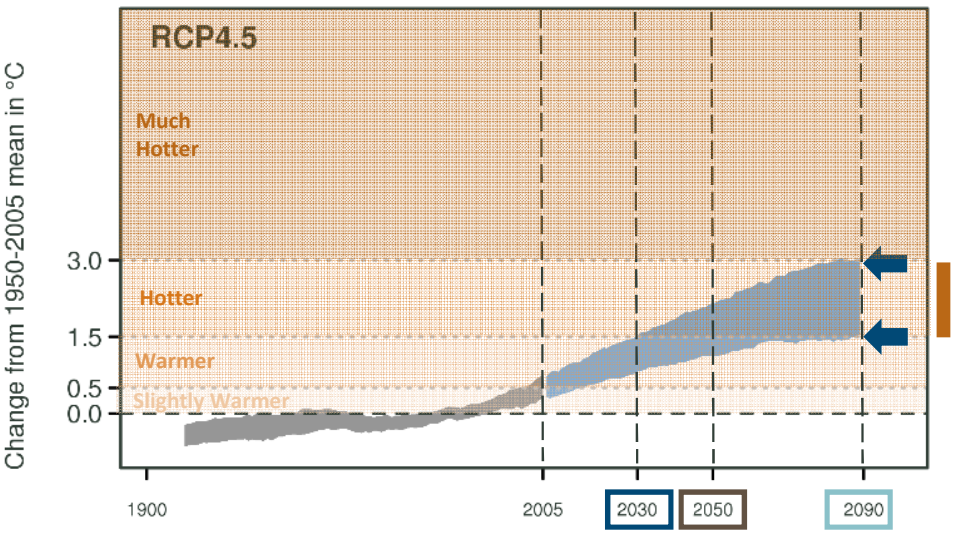
Climate projections for Monsoonal North (annual*) : Intermediate emissions

Rainfall



Temperature



2030: Warmer with most models showing little change in rainfall, though a chance of either wetter or drier climate occurs.

2050: Warmer to hotter with some models showing little change in rainfall, and other models indicating wetter or drier climates (e.g. ± 10 %).

2090: Hotter with some models showing little change in rainfall, with other models showing much wetter or much drier climates (e.g. ± 15 %), resulting in an increase in the range.

***Seasonal projections may differ from annual. Seasonal detail shown later.**
Maximum model consensus by 2090, if it exists, is indicated by orange bar.
For adaptation planning, consider top and bottom of the range of plausible change. The 2090 range is indicated by the blue arrows.

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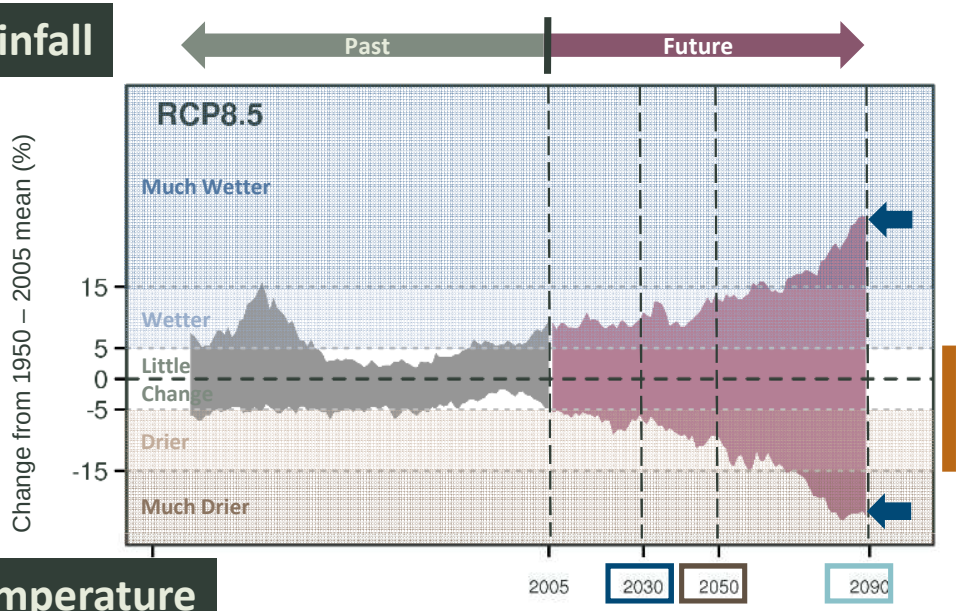
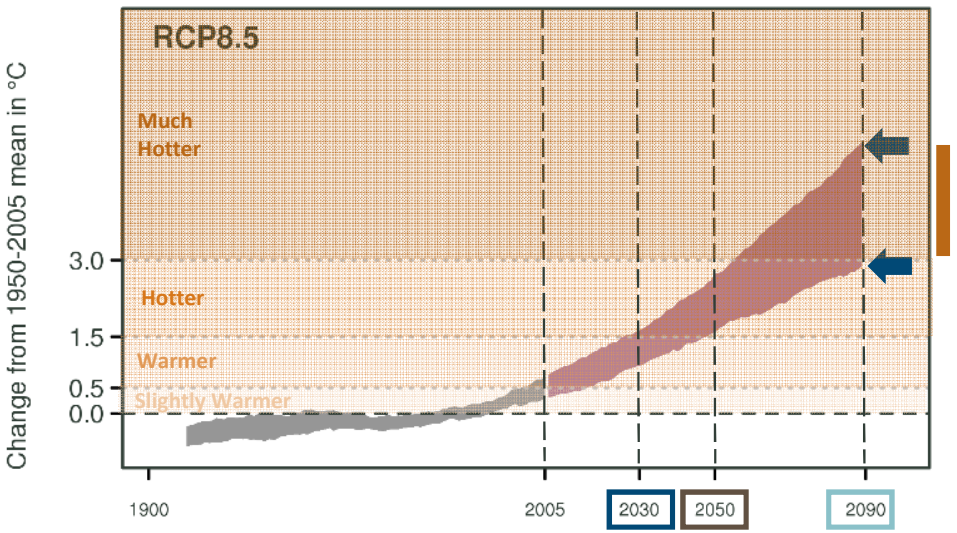
Climate projections for Monsoonal North (annual*) : High emissions

Rainfall



Temperature



2030: Warmer with most models showing little change in rainfall, though a chance of either wetter or drier climate occurs.

2050: Hotter with some models showing little change in rainfall, and other models indicating wetter or drier climates (e.g. ± 15 %).

2090: Much hotter with some models showing little change in rainfall, with other models showing much wetter or much drier climates (e.g. ± 25 %), resulting in an increase in the range.

***Seasonal projections may differ from annual. Seasonal detail shown later.**

Maximum model consensus by 2090, if it exists, is indicated by orange bar.

For adaptation planning, consider top and bottom of the range of plausible change. The 2090 range is indicated by the blue arrows.

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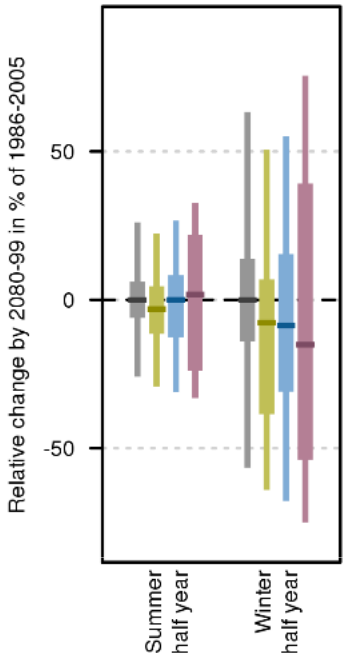
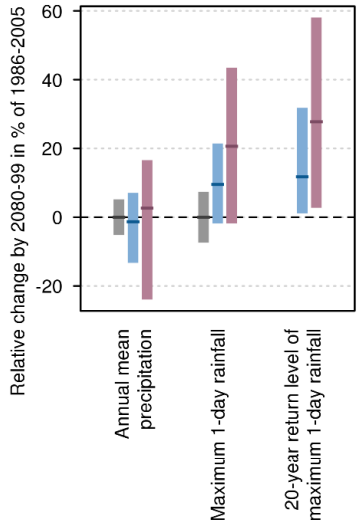
Seasonal Rainfall

Graph shows projected change in seasonal precipitation for 2090 (2080-99) in (from left) summer, autumn, winter and spring. Anomalies are given in % relative to 1995(1986-2005) under RCP2.6 (Green), RCP4.5 (blue) and RCP8.5 (purple). Natural climate variability is represented by the grey bar.



Extreme Rainfall

Modelled differences (per cent) in annual average rainfall, rainfall on the wettest day of the year, and rainfall on the wettest day in 20 years for 2080-2099 compared to 1986 to 2005 under RCP4.5 (blue) and RCP8.5 (purple). Natural climate variability is represented by the grey bar.



Providing confident rainfall projections for the Monsoonal North cluster is difficult because global climate models offer diverse results, and models have shortcomings in resolving some tropical processes.

Natural climate variability is projected to remain the major driver of rainfall changes in the next few decades.

Despite uncertainty in future projections of total rainfall for the Monsoonal North cluster, an understanding of the physical processes that cause extreme rainfall, coupled with modelled projections indicate with high confidence a future increase in the intensity of extreme rainfall events. However, the magnitude of the increases cannot be confidently projected.

Drought will continue to be a feature of the regional climate variability, but projected changes are uncertain

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