

# OFF THE CHARTS

Record breaking  
September Heat  
and Climate  
Change

Australia has broken all the wrong records this year—we broke over 120 extreme weather related records in the 2012/2013 summer. We experienced the hottest January on record, the hottest summer and the hottest day ever recorded in Australia. We have just experienced the warmest September in Australia's history, as well as the warmest 12-month period, and we are on track to break yet another record for the warmest calendar year ever recorded in Australia.

Climate change means that we are experiencing hotter days, and heatwaves are becoming more frequent and more severe. Heatwaves have a wide range of negative impacts on human health, agriculture, industry and many plants and animals.

The Climate Council is an independent non-profit organisation funded by donations by the public. Our mission is to provide authoritative, expert advice to the Australian public on climate change.



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## KEY FACTS:

- 1** This September is the warmest in Australia's history, with the national average temperature for the month 2.75 degrees above the long-term (1961–1990) average. September 2013 also set a record for the largest positive anomaly (difference between the observed temperature and the long-term average) for any monthly average temperature.
- 2** The average temperature for Australia for the 12 months from October 2012 to September 2013 was 1.25°C above the long-term average. This was 0.17°C warmer than any 12-month period prior to 2013.
- 3** The frequency and severity of hot days and heatwaves is increasing as average global temperature is rising.
- 4** Although Australia has always had heatwaves and hot days, climate change is increasing the risk of more frequent and longer heatwaves and more extreme hot days, as well as exacerbating bushfire conditions. There have been more than 100 heat-related records broken over the past year, and this year is on track to become Australia's warmest year on record.
- 5** Hotter days, occurring more frequently, present wide-ranging risks for human health and wellbeing. Good community understanding of climate change risks is critical to ensure we take appropriate action to reduce greenhouse gas emissions and to put measures in place to prepare for, and respond to, extreme weather.
- 6** It is essential to reduce CO<sub>2</sub> emissions rapidly and deeply to stabilise the climate and halt the current trajectory towards more extreme weather events and hotter average temperatures.

## WHAT HAVE WE SEEN THIS SEPTEMBER?

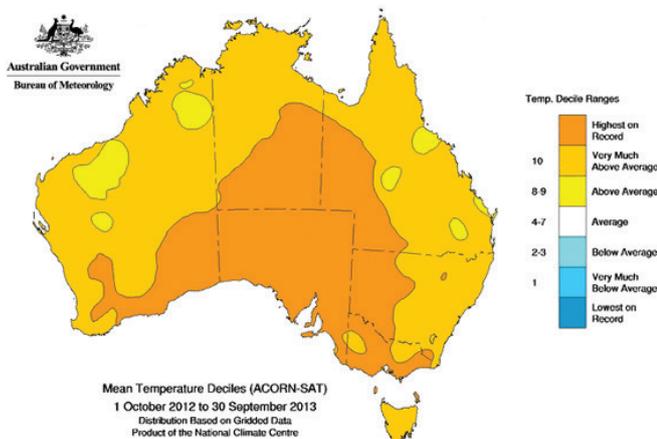
The Bureau of Meteorology's report today (BoM, 2013) stated that not only is this September the warmest September on record; but it is the warmest September by the greatest *margin* of any recorded monthly temperature increase we have experienced in Australia.

Currently 2013 is tracking to be the hottest year on record for Australia. The average temperatures for the previous 12 months surpasses that of any 12 month period prior to 2013 by 0.17°C. Previously the hottest year on record was 2005. Globally, the hottest 10 years on record have all occurred during the last 15 years (NASA, 2012).

This September is part of a series of records broken over the last 18 months as Australia experiences persistent heat continent-wide. There have been fewer cold days and consistent above-average temperatures. Widespread record warmth has also been recorded in the oceans around Australia.

The latest report from the Bureau of Meteorology highlights the large number of mean temperature records that have fallen across Australia in the last year, including:

- Australia's warmest month on record (January)
- Australia's warmest September on record
- Australia's largest positive monthly anomaly on record (September)
- Australia's warmest summer on record (December 2012 to February 2013)
- Australia's warmest January to September period on record
- Australia's warmest 12-month period on record (broken twice, for the periods ending August and September)
- Indeed, Australia's warmest period on record for all periods 1 to 18 months long ending September 2013



Graphic created by the Bureau of Meteorology.

## THE CLIMATE CHANGE LINK?

Hot weather has always been common in Australia. However, in the past few decades it has become more common and severe as global temperatures have risen.

Greenhouse gases in the atmosphere trap heat, so the more greenhouse gases there are in the atmosphere, the more heat is trapped. The increase in temperature observed around the world in the atmosphere and in the ocean is directly connected to the increase in greenhouse gases from human activities (IPCC, 2013).

There has been a significant increase in the frequency of hot days (days over 35°C) and hot nights over the last 50 years in Australia (CSIRO and BoM, 2012). The frequency of record hot days has been more than three times the frequency of record cold days during the past ten years (Trewin and Smalley, 2012).

Australia's average temperature has already risen by 0.9°C since 1910 (CSIRO and BoM, 2007). This is consistent with the global trend of increasing average temperature.

Although a temperature increase of 0.9°C may seem modest, small changes in average temperature can have a significant impact on the frequency and nature of extreme weather events. When the average temperature shifts, the temperatures at the bottom and top of the temperature scale shift too. As the average temperature increases, the distribution of the range of temperatures shifts to include a greater likelihood of more extreme hot temperatures and less extreme cold temperatures. For example, the number of record hot days across Australia has doubled since 1960 despite an average temperature increase of only 0.9°C (CSIRO and BoM, 2007). Many more record hot days will occur if global warming progresses unabated during the 21st century.

## WHAT ARE THE CONSEQUENCES OF AUSTRALIA HEATING UP?

More frequent and more severe hot days and heat waves affect human health, and plant and animal well-being. We have seen the impacts of several heatwaves over the last decade. For example, during the 2009 heatwave in Melbourne, there were 980 heat related deaths—that's 374 deaths more than would have normally occurred.

Heatwaves are the most significant natural hazard in Australia in terms of loss of life. Humans can only survive if our core body temperature remains within a certain, limited range. When we experience prolonged and unusually intense heat, our ability to cool ourselves through direct transfer of our body heat to the air and through sweating becomes less effective. This results in heat exhaustion, which can then lead to heatstroke and death. The elderly, very young, people who work outdoors and people with existing health conditions are the most vulnerable to extreme heat.

The impacts of extreme heat do not only affect humans. As we saw during the Melbourne heatwaves, increased heat damages critical infrastructure including energy transmission and rail transport. Heat also affects the agricultural sector, with animals more likely to suffer heat stress and large increases in temperature reducing the yield and quality of many crops. Natural ecosystems are also affected by extreme heat, with the large number of deaths of flying foxes and cockatoos during severe heatwaves being prominent examples.

# WHAT CAN WE EXPECT TO SEE IN THE FUTURE?

The most recent IPCC report (IPCC, 2013) has confirmed that we have seen an increase in the frequency and severity of many extreme weather events, including hot days and heatwaves. Extreme heat will become an even more common occurrence as the climate continues to warm. The number of extremely hot days we are currently experiencing is increasing faster than climate models project and will only continue to rise further unless we substantially and rapidly cut our emissions of greenhouse gases, especially CO<sub>2</sub>. (CSIRO and BoM, 2007).

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