

Australia faces significant environmental and economic impacts from climate change across a number of sectors, including water security, agriculture, coastal communities, and infrastructure.

Leading scientists advise climate change will cause increases to the frequency and intensity of extreme weather events. Rising sea levels pose a significant risk to coastal communities, while the world's oceans could become too acidic to support coral reefs and other calcifying marine organisms. Changes to our climate have the potential to create major impacts on human and natural systems.

Further changes to our climate are likely if emissions of greenhouse gases continue to increase. This change is one of the greatest social, economic and environmental challenges of our time. Australia which happens to be one of the driest continents in the world already suffers the adverse effects of weather through long periods of drought to periods of intense flooding, severe bushfires and some of the hottest dry spells recorded when compared to other populated countries.

Human activity is causing the climate to change empirical evidence supports this. This, in turn, is having an impact on Australia's rainfall, temperatures, bushfire frequency, health, heritage and biodiversity for current and future generations.

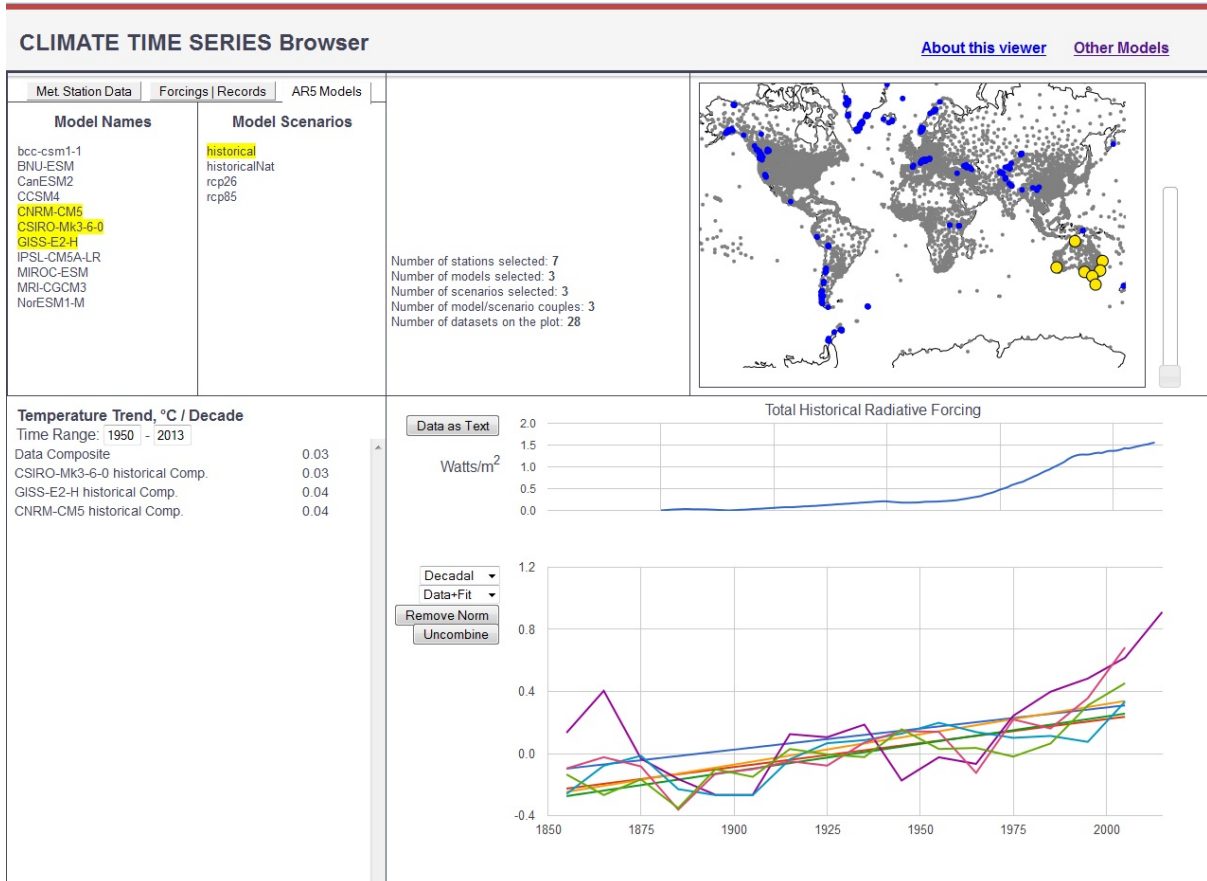
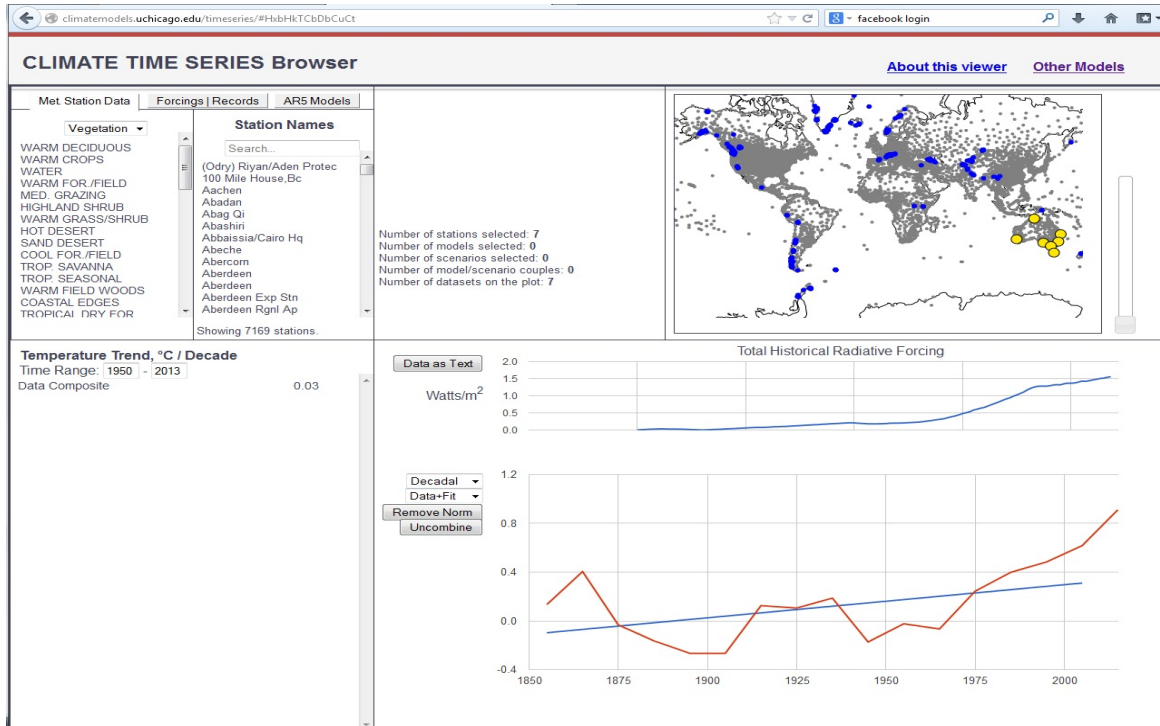
During the past 100 years, global average surface temperature increased by about 0.7°C. Since 1910 the average temperature of Australia has risen by about 1°C. Although these increases may sound small, they have a big impact on our climate.

The data below covers a period from 1954-2014

| Decade | Pth | Adl | Melb | Syd | Bris | Darw | Hob | Avr |
|---------------|-------|-------|-------|-------|-------|-------|-------|----------|
| 1954 | 18.02 | 16.10 | 14.00 | 17.46 | 19.85 | 27.54 | 12.50 | |
| 1964 | 18.22 | 16.35 | 14.20 | 17.09 | 19.67 | 27.30 | 12.25 | |
| 1974 | 18.44 | 16.37 | 14.40 | 17.72 | 20.10 | 27.66 | 12.68 | |
| 1984 | 18.44 | 16.46 | 14.51 | 18.04 | 20.28 | 27.88 | 12.93 | |
| 1994 | 18.73 | 16.48 | 14.45 | 18.19 | 20.32 | 27.75 | 12.74 | |
| 2004 | 18.42 | 16.98 | 14.94 | 18.68 | 20.49 | 27.61 | 13.21 | |
| 2014 | 18.94 | 16.80 | 14.97 | 18.88 | 20.56 | 28.25 | 13.40 | |
| Temp increase | 0.92 | 0.70 | 0.97 | 1.42 | 0.71 | 1.19 | 0.90 | 0.97 AVR |

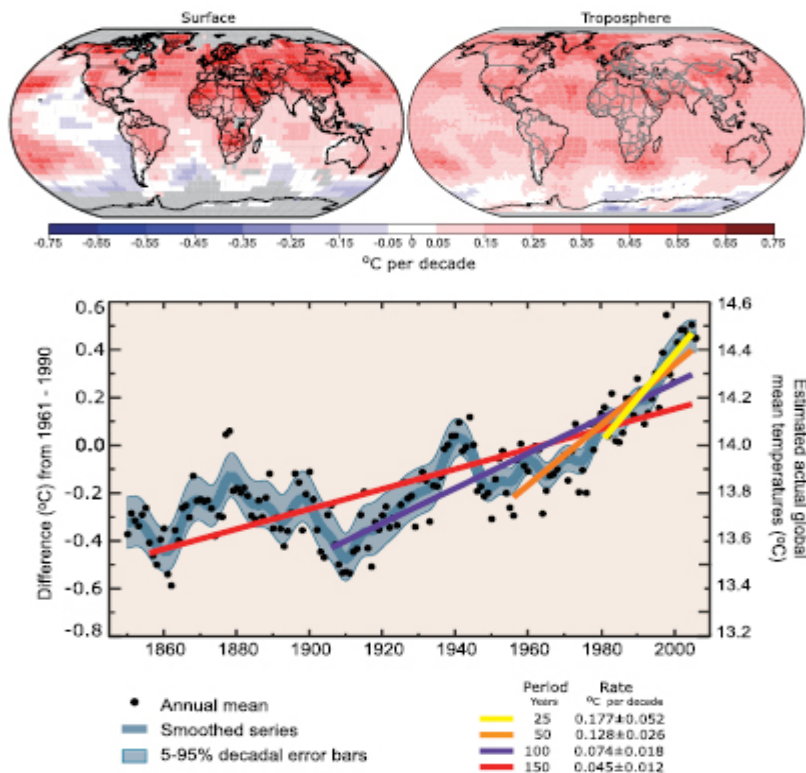
This data was extracted from the Climate Time Series browser for all major capital cities in Australia, using the Met station historical data, the mean average temperature change in

the last 50-60 years is shown below this correlates closely with other models using the historical data as per the second chart below



These plots correlate to the mean average global rise as per the IPCC - TS 3.1.1 figures below. Surprisingly the CSIRO model Mk 3-6-0 returns slightly lower decadal temperature changes using the historical data from the selected Met sites while the GISS model returns data which correlates closely although overall temperatures shown are slightly higher than the Met figures.

Global Temperature Trends IPCC



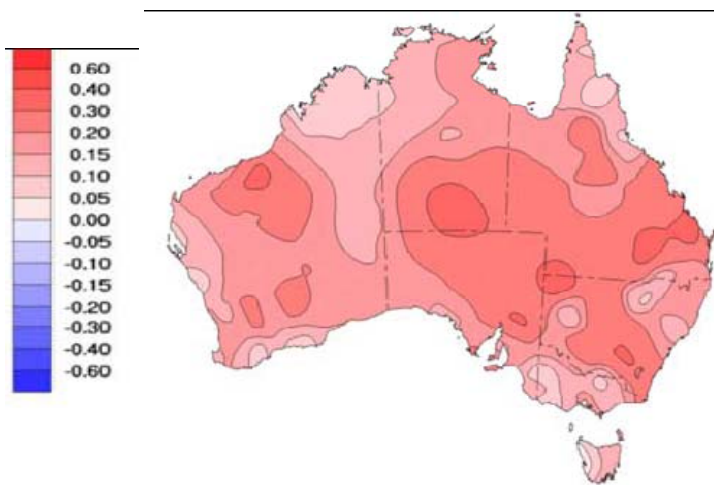
The top patterns of linear global temperature trends over the period 1979 to 2005 estimated at the surface (left), and for the troposphere from satellite records (right). Grey indicates areas with incomplete data. (Bottom) Annual global mean temperatures (black dots) with linear fits to the data.

The left hand axis shows temperature anomalies relative to the 1961 to 1990 average and the right hand axis shows estimated actual temperatures, both in °C. Linear trends are shown for the last 25 (yellow), 50 (orange), 100 (magenta) and 150 years (red). The smooth blue curve shows decadal variations with the decadal 90% error range shown as a pale blue band about that line. The total temperature increase from the period 1850 to 1899 to the period 2001 to 2005 is $0.76^{\circ}\text{C} \pm 0.19^{\circ}\text{C}$.

Two major Australian organisations, the CSIRO (Commonwealth Scientific and Industrial Research Organisation) and the ABOM (Australian Bureau of Meteorology) have combined to present a current picture of Australia's climate and the factors that influence it. The

Bureau of Meteorology has been observing and reporting on weather in Australia for over 100 years, while the CSIRO has been conducting atmospheric and marine research for over 60 years.

CSIRO reported data for the period 1960-2009 (c/decade) correlates closely to IPCC data, showing that since 1960 the mean average temperature in Australia has increased by about 0.7 degrees C and that since 1910 the figures provided by the ABOM show an increase of .9c although there are substantial year to year variability of plus/minus 0.5c, however some areas have experienced warming of 1.5 to 2 C in the last 50 years.



The CSIRO and Bureau of Meteorology State of the Climate 2012 reports that:

- Australian annual average daily mean temperatures have increased by 0.9 °C since 1910.
- Global average mean sea level for 2011 was 210 mm above the level in 1880.
- Sea surface temperatures have increased by about 0.8 °C since 1910.
- The main cause of the observed increase in carbon dioxide concentration in the atmosphere is the combustion of fossil fuels since the industrial revolution.
- Australian average temperatures are projected to rise by 1.0 to 5.0 °C by 2070 when compared with the climate of recent decades.

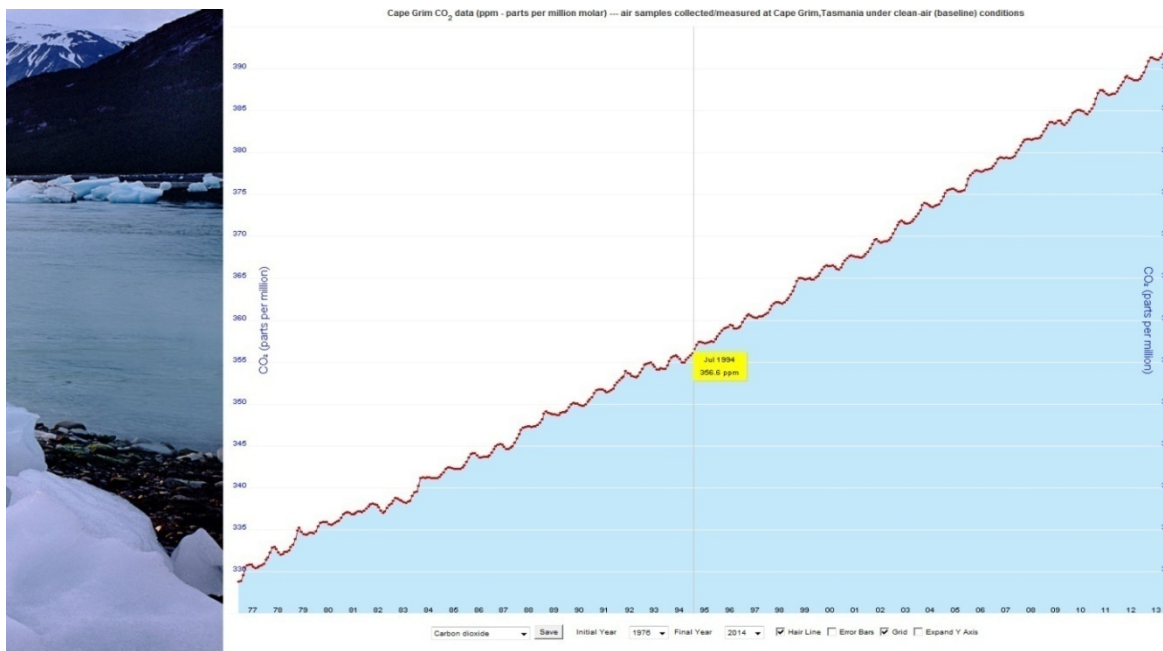
Furthermore these changes in the last 50-60 years are consistent evidence of global warming in terms of temperature (and rainfall) as far as Australia is concerned whereby

- The last 5-10 years have seen some of the most severe droughts in our history
- Southern and Eastern Australia have had more heat waves, fewer frosts and less rain
- Inflows into many of our rivers and dams have declined significantly
- The number of hot days and nights has risen while there have been fewer cold days and nights
- All years since 1990 have been hotter than average

- Sea levels have risen 17cm since 1900

Greenhouse gases such as carbon dioxide, methane, nitrous oxide and water vapour trap the sun's heat and warm the atmosphere.

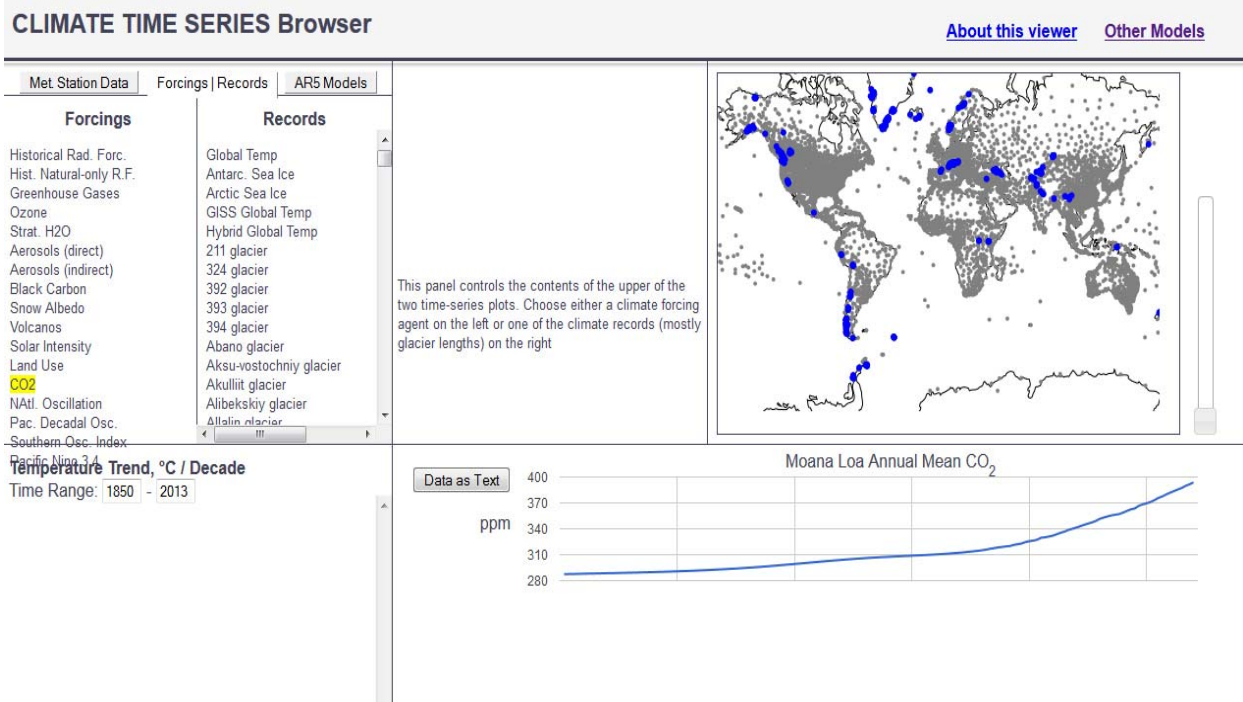
Accurately named CO₂ data collected from the Cape Grim site in Tasmania shows that CO₂ levels have increased significantly in the last 30 odd years from 330ppm to nearly 400ppm with an upwards trend that is heading towards 750ppm or more by 2100.



The Cape Grim Baseline Air Pollution Station monitors Southern Hemispheric air. In the Northern Hemisphere, the Mauna Loa Observatory in Hawaii has been continuously monitoring and collecting data related to atmospheric change since the 1950s.

The Cape Grim station is positioned just south of the isolated north-west tip (Woolnorth Point) of Tasmania. It is in an important site, as the air sampled arrives at Cape Grim after long trajectories over the Southern Ocean, under conditions described as 'baseline'. This baseline air is representative of a large area of the Southern Hemisphere, unaffected by regional pollution sources (there are no nearby cities or industry that would contaminate the air quality).

Data extracted from the time series browser for reading taken at the Moana Loa site match the Cape Grim data



Coal, oil and gas will always be finite resources once they are gone we may have nothing because our planet will have been destroyed by their influence that is if we fail to manage this finite resource and its legacy wisely.

Renewable energy sources such as solar, wind, wave, geothermal etc are needed to supply us with the energy we will need now and into the future. They have a cost benefit ratio that exceeds trying to mine resources off world which will be our only option after the wells dry up and the coal streams peter out.

We only have to look at the investment in buildings and tourism etc by the UAE states to see that even those with vested interests realise that their wells will dry up eventually.

Decisions made today about infrastructure, health, water management, agriculture, biodiversity and housing will have lasting consequences for future generations of Australians. If policies are not implemented to reduce carbon emissions while working towards the adoption of more green policies on a global front we may as well hang our heads in shame and suffer the consequences of our inaction.

Although change cannot be achieved by Australia alone as a nation we cannot sit on the fence in the face of adversity but need to act in a manner that will influence other nations to be more proactive. By working together we can ensure future generations enjoy our planet as we and our forefathers have but if we fail to act soon all our efforts may be to no avail.

“I shed a tear for what I fear may be the future of our biosphere”-

References:

CSIRO, Australian Bureau of Meteorology State of the Climate report 2012

International Panel on Climate Change , IPCC, website

Climate Time Series Browser- University of Chicago