Chris Gillham
2a Burdham Way
Balga 6061
Western Australia
chris@scribeworks.com.au
Phone 08 9349 1268

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The Hon. Bob Baldwin MP
Parliamentary Secretary for the Minister to Environment
PO Box 6022
House of Representatives
Parliament House
CANBERRA ACT 2600

Dear Mr Baldwin,

You have appointed a panel to review the Bureau of Meteorology's official national temperature records and I believe it is important that you and panel members are aware of original historic recordings since settlement that suggest the rate of climate warming in Australia is significantly less than claimed.

CSIR pre-1931

The most authoritative collation of unadjusted temperature records across Australia to the year 1931 is within *Meteorological Data for Certain Australian Locations* published by the Council for Scientific and Industrial Research in collaboration with the Australian Weather Bureau in 1933.

The document allows a comparison of raw temperatures at 226 weather stations operating from the mid 1800s to 1931 with their long-term records to 2014. This is a network more than twice as large as the Australian Climate Observation Reference Network (ACORN) upon which Australia's climate policies are based.

The comparison shows a 0.5C rounded or 0.4586C precise mean temperature increase from 1855-1931 to 2000-2014 averaged across all 226 locations.

Because of the Urban Heat Island (UHI) warming influence, the mean temperature of Australia's eight major capital cities increased 0.7292C from 1855-1931 to 2000-2014 and the other 218 locations increased 0.4486C or a rounded 0.4C across Australia outside the capitals.

About a third of temperatures recorded in the CSIR dataset were in non-Stevenson thermometer screens but any pre-1931 mean bias is likely to be less than 0.1C. Conversely, almost all 226 locations have witnessed significant urban development and are subject to UHI which in Melbourne research was estimated to exceed 7C in that city.

Year Book 1911-1940

Another highly credible source of historic temperature records is issue #39 of the *Official Year Book of the Commonwealth of Australia*, published in 1953 and including mean temperature records tabulated by the Weather Bureau from 1911 to 1940 at 44 locations across the country to accurately portray Australia's climate history for a global audience.

The Year Book data suggest Australia's mean temperature increased 0.4C from 1911-40 to 2000-2014, similar to the new millennium comparison with the pre-1931 CSIR dataset. All temperatures in the 1911-40 Year Book dataset were recorded in Stevenson screens.

There are 19 corresponding stations in the Year Book and ACORN datasets during 1911-40 and ACORN mean temperature adjustments during that climate period cooled the original temperatures by 0.6C.

ACORN adjustments

ACORN adjustments effectively double the recorded rate of 0.4-0.5C warming. They are based on assumptions and estimates of historic artificial warming caused mostly by weather station relocations and non-Stevenson recordings. However, the adjustments are biased.

For example, at least a third of all pre-Celsius temperatures in Australia were rounded .0F and it is likely a disproportionate number were truncated down. The BoM acknowledges this observer practice probably caused a 0.1C historic cooling bias yet has chosen not to adjust pre-1972 temperatures in response.

Comparisons indicate the Glaisher observation screens that dominated before 1900 recorded a mean 0.2C warming bias over a full year. There is is no ACORN adjustment for UHI and numerous historic documents suggest early temperatures were more reliable than their adjusted counterparts in ACORN.

Data accuracy

Be mindful that ACORN lists Australia's hottest ever day as 51.2C on 8 February 1933 at the cool southern WA coastal town of Albany, despite unhomogenised raw records showing that day reached 44.8C. Such glaring errors indicate the ACORN adjustment process is less reliable than the unadjusted temperatures originally recorded by diligent and usually intelligent weather station observers since the 1800s.

The 226 station CSIR network has more than twice the locations in ACORN. It is a more comprehensive and accurate average of national climate before 1931. At the same time it is directly comparable, notwithstanding possible location shifts within a district, but without the bias caused by historically hot locations that were added to overall ACORN averages as late as the 1970s.

It is true that two locations a few kilometres apart can record warmer or cooler temperatures but each location undergoes its own artificial and natural variations over time, and adjustments from overlap comparisons are only correct at the time of comparison.

The complexity of adjustments demands too many assumptions that are but should not be applied algorithmically to long periods instead of the unknown nuances that can artificially or naturally raise or lower a weather station's temperature on any given day. The original temperatures are no more or less accurate, particularly when averaged over a year.

Recommendation

I recommend the BoM be directed to digitize the vast amount of 1800s and early 1900s written temperature observations, much stored in the bureau's archives or in libraries across Australia, and their averages accepted as accurate without adjustment.

The CSIR and Year Book datasets provide a large number of comparable historic temperature records that have not been adjusted by ACORN and allow a more thorough insight to Australia's early climate than available in the BoM's raw records.

I urge panel members to analyse these datasets that suggest ACORN adjustments have doubled Australia's rate of warming over the past century, and be aware of these unadulterated temperatures when considering the accuracy of the BoM's homogenised records in ACORN.

Yours in Trust

Chris Gillham

References:

• *Meteorological Data for Certain Australian Localities* (http://www.waclimate.net/csir.pdf) published in 1933 by the Council for Scientific and Industrial Research collating minima and maxima from the earliest records up to and including 1931

• *Official Year Book of the Commonwealth of Australia* (http://books.google.com.au/books?id=CEcEIOMinwkC&lpg=PA31&dq=hottest%20january%20day%20australia&num=4&client=internal-uds&pg=PA30#v=onepage&q&f=false), issue #39 published in 1953 including tabulated mean temperature readings from 1911 to 1940 at 44 locations across Australia

• Bureau of Meteorology *Climate Data Online* (http://www.bom.gov.au/climate/data/)

• *The Australian Climate Observations Reference Network - Surface Air Temperature* (ACORN-SAT) (http://www.bom.gov.au/climate/change/acorn-sat/) current to June 2014

• Fahrenheit recordings in the CSIR and Year Book documents are converted to Celsius and tabulated in spreadsheets to allow comparison of temperatures at corresponding locations in the Bureau of Meteorology's RAW and ACORN datasets within different timeframes, and all spreadsheets can be downloaded at http://www.waclimate.net/year-book-csir.xls

• CSIR and Year Book findings are summarised at http://www.waclimate.net/year-book-csir.html